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EAST EUROPE REPORT

SCIENCE & TECHNOLOGY

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CONTENTS

DEVELOPMENT, PRODUCTION, APPLICATION OF ROBOTS ASSESSED

Warsaw TRYBUNA LUDU In Polish 15-16 Sep 84 p 3

[Interview with Stanislaw Golab by Tadeusz Jaworski: "Robots Do Not Tolerate a Lack of Precision"; time and place of interview not given]

> [Text] A shortage of workers, especially in production line positions, has made it necessary to introduce mechanization automation and robotics into manufacturing processes. For some time now, "Promasz" has been involved in the development of a robotics program for Poland. There is much to be done in this field and there are many misunderstandings about robots and robotization that seem to need explanation. I am speaking on this subject with Stanislaw Golab, the deputy director of the "Promasz" Research and Development Bureau of the Steel and Iron Metallurgy and Machine Industry.

[Golab] Essentially, our robot technology is far behind that of other countries, both capitalist and socialist. There are also many misunderstandings about robotization. This was shown by a poll taken by our bureau at over 500 steel and machine industry plants. The main purpose of the poll was to determine the demand for robots among various enterprises.

It turned out that not many plants see any need for robots or manipulators in their production technology. In the plants that we polled, there was a demand for 150 such devices over the next two years with another 700 by the end of 1990. These are ridiculously small numbers.

[Question] How does these numbers with those from other CEMA [Council for Economic Mutual Aid] countries?

[Answer] Unfortunately, any such comparisons must arouse alarm. In comparison to all of the other CEMA countries, we are very far behind. For example, the annual production of robots and manipulators in the USSR is now about 14,000 units and they already have 40,000 of the devices in operation.

By 1985, 40,000 robots and manipulators will have been produced in the German Democratic Republic. This amounts to an output of about 10,000 units per year.

There are about 360 robots and manipulators operating in Poland at the present

time. In connection with this, the small number of 605 robots manufactured in Poland have not yet been sold in their entirety, mainly due to a lack of interest on the part of firms and this has slowed down their production. The license that we purchased in Sweden to manufacture their robots here has also not been developed any further.

[Question] Returning to the poll that revealed the misunderstandings about robotization, what sort of misunderstandings are these?

[Answer] The misunderstandings are over very elementary matters, such as the differences between robots and manipulators, which are often the same thing. A manipulator is a device that is much simpler than a robot, is much less programmable and does not usually involve the use of electronics. In connection with this, it has fewer possibilities for taking advantage of technological movements. Manipulators can be controlled manually and they are typically auxiliary devices. On the other hand, robots can perform manipulatory actions under the automatic control of an electronic system.

This misunderstanding of the difference between the two has led to further misunderstandings. A plant of a low technological level cannot afford a robot because one requires much auxiliary equipment that is frequently more expensive than the robot itself. Furthermore, highly-qualified personnel is needed to service and maintain the robot. Introduction of a robot to production is justifiable if its use would take the place of several persons and do the work more accurately and faster. Robotization cannot be introduced on the basis of one robot per factory at a time. We have already heard the same things said about the introduction of telexes. The main consideration must be profits and the elimination of dangerous working conditions for people.

We are therefore even more surprised at the results of our poll when we see that large plants suffering from labor shortages and dangerous working conditions do not understand the need for robots. There are also opposite cases where a small plant wishes to have a robot without any sort of economic or technological justification for one.

[Question] The economic justification is so important that plants are introducing robotics at prime cost.

[Answer] That is in accordance with the principles of economic reform but, as the steel and machine-building industries have already determined, there does exist the possibility of receiving financing from a central fund for technological and economic progress. There is, however, no definite general principle that a plant planning to introduce robots is in any way privileged.

In Czechoslovakia, for example, a system of dual pricing for robot devices is being used. The producer is obligated to one price which is based on his calculations and the other price is paid by the robot's purchasers. To put it simply, the buyer receives a 20-30 percent reduction. This is supposed to encourage robot use. We still do not have this type of system but propositions of this kind have been submitted. What we are concerned with is making it possible to financially assist the plants that want to and can use robots to the

benefit of the entire national economy.

[Question] We still have not talked about the quality of Polish-made robots that are available on our market. This would undoubtedly be a great impetus to robotization of our industry.

[Answer] It would indeed. Many of the first robots produced in Poland had defects or were carelessly used in a technological or organizational sense. Robots can give better results but they must be concentrated into specific technological groups forming the center of the entire organizational structure of the plant. The operation of robot-operated sections must be preceded by automation of a level of output equal to that achieved by robots working on the same line. Any other case would result in bottlenecks or shortages.

Disregard for these relationships will cause people to complain that robots are slow and work poorly. It is another matter altogether that the operational possibilities of domestically produced robots are still very limited and that they are not very reliable. In my opinion, our scientific research and development organizations should modify and improve the quality of robots. We can do this in cooperation with other CEMA nations.

[Question] I would like to end with this question: can we afford not to introduce robot technology?

[Answer] Absolutely not. Polish industry must introduce robot technology. This is not because of worldwide trend toward the use of robots but more than anything due to the fact that Poland is experiencing a sharp deficit in labor. Even if we add the necessity of removing human labor from dangerous working conditions, we still have not exhausted all arguments for the introduction of robotics. The improvement of production quality is no trifling matter, especially in the machine-building industry. These are problems that must be solved by robotization. Naturally, a robot cannot solve all problems of production quality but it will bring progress in this area. A robot will not tolerate any lack of precision and it must operate within a precise system.

12261
CSO: 2602/49

U.S. EMBARGO ON HIGH TECHNOLOGY EXPORTS CRITICIZED

Sofia POGLED in Bulgarian 27 Aug 84 p 6

[Article by Encho Gospodinov, foreign policy commentator for POGLED: "The Technology War"]

[Text] Under pressure from the United States, the British firm of Thomson and the Swedish Erikson firm refused, one after the other, to sell an electronic telephone exchange to a socialist country; just a few days ago West German industrialists protested against the pressure exerted by the United States to restrict trade with the socialist countries. These facts bring us back to 13 July of this year, when a large group of men in dark suits gathered in the annex of the American Embassy in Paris in order to decide which new goods and technologies should be added to the blacklist. Its thick volumes explicitly point out which items the West should refuse to sell to socialist countries. The men mentioned above were representatives of the "technological Masonic Lodge" called COCOM (the Coordinating Committee for Multilateral Control of Export), established in 1950 by the member countries of NATO and Japan. The lodge meeting took place, as always, in an atmosphere of extreme secrecy.

Thus, in one way or another, a war of technology has been declared. It is no accident that the idea of this war against socialist countries finds its most zealous supporters in the military-industrial complex in the United States.

Here are the facts: during the last decade, Western Europe fell considerably behind in the so-called high technology field, in comparison with the United States and Japan. This includes the production of computers, microprocessors, telecommunications equipment, outer space apparatuses, etc. The United States and Japan now have control over most of the market for electronic products in capitalist and developing countries, and this is confirmed by their profits. About 50 percent of the profits go to United States firms, 40 percent to Japanese, and only 10 percent to Western European ones. In the course of just 2 years, from 1980 to 1982, West European firms lost about 10 billion dollars because of the mighty invasion of Japanese and American electronic giants.

That is not all, however. During the last few years, the United States felt that it was lagging behind Japan in terms of the future, especially in the area of the so-called strategic technologies related to the production of

special computers, robots, and various branches of electronics. American economists believe that the reason for this lag can be found in the fact that while the United States counts on the laws of market mechanisms, according to Reaganomics, Japan has managed to construct an organized state policy with scientifically planned ideas as to which technologies should be stressed, and to make preparations for them accordingly. This is also one of the main criticisms which the Democratic Party in the United States directs at Reagan. Or, as the president of Chrysler Corporation, Lee Iacocca, has said: "I believe in the free market, but I do see what the Japanese have done to us."

The response of Japanese engineers has been: "Our samurais did not succeed in conquering the world with their swords some time ago. Now we have been given the chance to conquer at least a part of it with our transistors." This sounds like an aphorism, although it has some logic, because the reason for the United States falling behind Japan in some future technologies is the fact that Reaganomics gives an exceptional advantage to military industries, to armament programs, which are the material base of the White House's political tendency. Thus not only have social programs suffered, but the so-called civilian industries have, too. On the other hand, in Japan the percentage of the budget spent on the military is far behind the means allocated solely for industrial needs. This has given Japan a certain technological advantage over many Western countries.

As a result of this reality, the following logic was born in Washington: to exert pressure through organizations such as COCOM on developed capitalist countries not to sell high technology products to socialist countries. According to the United States, this policy will have two consequences: socialist countries will lag behind economically, and by preventing Japan and Western Europe from exporting this type of product to Eastern Europe, they will be deprived of a good-sized market for it. This will lead to their lagging behind in the area of strategic technologies; in the meantime, the United States will forge ahead, obtain monopolies, and strengthen its domination over the world. This also explains the constant pressure on Japan and Western Europe to increase their military expenditures, which would slow down the development of purely civilian, through strategic, technologies of the future.

Western European countries and Japan are aware of this trap. There are sharp disputes going on in COCOM, and the position of the United States is being attacked by many. In West Germany, Peter Glotz, organizational secretary of the German Social Democratic Party, has said that the COCOM resolutions are insulting to West Europeans because they are imposed by Washington. These resolutions, according to Glotz, are nothing more than a means of fighting against the economic competition offered by Western Europe and Japan. Belgium fell victim to this policy after the Belgian firm of Pegar was forbidden to export lathes to the Soviet Union. The firm's losses now total 250 million francs (not including their forfeit). There was an outburst of indignation in Austria when the United States tried to stop the GFM firm from exporting to the Soviet Union, because its equipment, would have helped "the Russians to make better gun barrels."

Of course, the truth has another side, too: with the 43 billion dollars worth of annual injections into scientific research activity, American scientists, the cream of which is concentrated in Silicon Valley laboratories in California, have all the opportunities to catch up with the Japanese in some areas and to go ahead of them in others, by at the same time subjugating West European firms. This will remain the policy of the administration in the United States, even after the elections.

As for the consequences of the officially declared technology war against the socialist countries, the scenario will obviously not develop as it was foreseen in Washington, for at least two reasons. The first one is that the Soviet Union has a sufficiently powerful scientific potential to handle the provocation now directed against the Soviet Union and its allies. The prominent American politician Nicholas Mavrulis, himself a member of the Armed Forces Committee of the House of Representatives, wrote in THE NEW YORK TIMES: "It is not realistic to expect that the American approach to trade could deprive the Soviet Union of contemporary equipment and technology, and as a result force it back to the Middle Ages...The Russians are capable of developing similar technologies themselves and their science is now at an extremely high level..."

The second reason is related to the fact that our trade exchange with capitalist countries is not decisive for the future of the economies in the socialist countries. Imports to the Soviet Union from the United States are only one-tenth of its total imports from capitalist countries, which in themselves are one-third of the total foreign trade of the Soviet Union. Under these circumstances, it is unrealistic to think that the Soviet Union could be forced to its knees by such measures.

Of course, as we know, normal trade is supposed to be mutually beneficial, and therefore the lack of trade relations means that there is less for both sides. For Western Europe, the United States, and Japan, it means more unemployment after various orders to socialist countries are halted. (In the United States alone, during 1980-1982, 50,000 Americans remained jobless because their firms were forced to cut exports to the Soviet Union.) All things considered, this approach has a purely class orientation: the management team in the United States strives to strengthen its position in the international market at the expense of its allies. This is an antihuman approach because it is essentially aimed at slowing down economic prosperity and poisoning the international climate.

It was pointed out at the last high-level meeting of the member countries of the Council of Mutual Economic Assistance in Moscow that the scientific-technical potential of these countries has enough power and flexibility to respond to the technological provocations of the West. No doubt it will be difficult, but it will be done.

An embargo will not stop life. The person who uses it as a class instrument, however, will lose even more.

12334
CSO: 2202/24

ACHIEVEMENTS IN DEVELOPMENT OF SPACE METEOROLOGY

Sofia SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE in Bulgarian No 3, 1984 pp 16-21

[Article by Dr V. Zakhariev: "Development of Space Meteorology in Bulgaria"]

[Text] The beginning of research in the field of space meteorology dates from 1967, when the Working Group on Space Meteorology was formed to take charge of this research, along with the other working groups under the National Committee on Research and Use of Outer Space*. The fact that space meteorology in Bulgaria was able to develop rapidly and make material progress is due to a very great extent to the international cooperation of the socialist countries, and above all to the invaluable assistance rendered by the Soviet Union. Our scientists and specialists were afforded splendid opportunities for availing themselves of Soviet space engineering, and for rapidly and efficiently assimilating Soviet exprience and undertaking research the results of which provided the grounds for acknowledging the priority of Bulgaria in some areas in which work is done on the "Interkosmos" Program. This is very clearly shown by the fact that Bulgaria was chosen in 1983, at the conference of the permanent working group on space meteorology held in the German Democratic Republic, to be general coordinator of the problem of research on atmospheric processes based on satellite photoraphs of the cloud cover. Note should also be made of the recognition accorded our scientists in other highly prestigious international organizations in the area of space research. For example, Vl. Sharov is one of the 12 executive members of KOSPAR Commission A, which is concerned with questions of meteorology, the earth's surface, climate, and the use of satellites to study these questions. This commission has only 2 other representatives of the socialist countries, one each from the USSR and GDR.

The mission of space meteorology is to study the atmosphere and to determine the main parameters describing its condition, by means of rocket probes and information obtained from weather satellites of the earth.

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*See K. Serafimov, "Structure and Organizational Mechanism of the 'Interkosmos' Program," SPISANIE NA BULGARSKATA AKADEMIYA NA NAUKITE, Number 1, 1983, page 60.

Data on the troposphere and the stratosphere, that is, the first 25 to 30 kilometers, where the processes determining weather take place, are especially important in weather forecasting.

The great value of satellite information in study of these processes is clearly shown by the fact that to make a forecast even for 2 to 3 days it is necessary to know the condition of the atmosphere above the northern hemisphere. Above the globe there is currently a network of thousands of weather stations at which regular observations are made. But it must be pointed out that about 4/5 of the earth's surface is covered by oceans, seas, and inaccessible regions weather information from which is wholly inadequate or entirely absent. In effect the gap in information can be filled only by data from weather satellites.

Sharp increase in the volume of weather information is unquestionably beneficial, but satellite research is of even greater importance in gaining a deeper understanding of the essential nature of the processes associated with the weather and the artificial influence on it and climate. At the same time, remote exploration of the earth's atmosphere is a prerequisite for investigating the atmosphere of other planets through comparative measurements.

A number of results obtained by Bulgarian scientists in the sphere of satellite meteorology have received wide international recognition. They are the results of research into the synoptic processes above the Mediterranean and the establishment of meteorological fields by means of data from weather satellites above little studies regions. The information currently obtained from weather satellites is of 2 types: an image of the cloud cover and the underlying surface in the visible and infrared regions of the spectrum, that is, through reflected radiation, and that irradiated from the earth's surface. In addition, direct measurement is made of the variation in the temperature of the earth-atmsophere system over time and space, this measurement being needed for vertical probing of the atmosphere.

The first, and still the only, morphological classification of cloud vortices in the Mediterranean was proposed in 1971. In 1973, Vl. Sharov and Ya. Tomova determined for the Mediterranean vortices the temperature and pressure conditions associated with the corresponding morphological types, which had been identified on the basis of satellite data, and a method was devised for quantitative evaluation of the pressure field by means of the cloud cover above this area of such great importance to Bulgarian weather. Later in the series of projects under the direction of Vl. Sharov, methods were elaborated for objective analysis of meteorological fields through simultaneous use of satellite and conventional meteorological data, and procedures were developed for assimilation of asynoptic information. A number of the typical features of the Mediterranean cloud vortices were also determined with greater precision. It was found, for example, that a configuration most closely resembling the spiral of Archimedes is typical of the spiral structure of these vortices. On the basis of this feature a method was devised for objective determination of the "convergent center"

of the cloud vortices by means of reference standards. This method very quickly gained universal recognition and is now in wide use, since the convergent center is a fundamental characteristic of cloud vortices, and visual determination of it (aside from being fraught with sizable subjective errors) is very difficult, and sometimes impossible.

An event of great importance was discovery of the spatial classification of cloud vortices by types. This discovery was accompanied by the fundamentally important finding that the maximum intensity of vortices of different morphological types varies with the geographic location.

These and other findings obtained in Bulgaria concerning the relationship of cloud vortices to circulation above the Mediterranean formed the basis for the international monograph "Mediterranean cyclones in the Cloud Cover Field" published in the USSR in 1975, one of the authors of which is Vl. Sharov.

High international esteem is also accorded the results obtained by Vl. Sharov and the group working under his direction in connection with study of local meteorological processes using satellite data. For example, investigation of the influence of underlying surface heterogeneity on distribution of the cloud cover and precipitation was conducted on the basis of the model proposed by Vl. Sharov. In collaboration with K. Stanchev, he also elaborated a model for study of vertical stability in the atmosphere accompanied by use of satellite observations of orographic clouds and aerologic data. Many of the results obtained by Bulgarian authors in investigation of mesoscale processes have been dealt with in another international monograph, "Use of Data on Mesoscale Cloudiness Features in Weather Analysis" (also published in the USSR in 1973 and also with Vl. Sharov as coauthor).

The results of research by Bulgarian scientists in the field of satellite meteorology have been received with interest and have been highly rated at a number of very prestigious international symposia attended by the most prominent specialists in the world. It is no coincidence that a large portion of the Bulgarian research has been published in the USSR, Hungary, the US, England, etc. These results are widely cited in monographs recently published abroad, especially in the USSR.

In 1982 there was published in the USSR the "Rukovodstvo po ispol'zovaniyu sputnikovykh dannykh v analize i prognoze pogody" [Guide to Use of Satellite Data in Weather Analysis and Forecasting], which is a result of the many years of research conducted under the "Interkosmos" Program. This guide draws liberally on the results obtained by Bulgarian scientists, and one of its responsible authors is Vl. Sharov.

Especially interesting results have been produced by the personnel of the Satellite Meteorology Laboratory of the Institute of Hydrology and Meteorology (IKhM) in 1983. Toward the middle of the year an interesting study was published on the Karman vortex streets in the atmosphere. This study proposes, and successfully tests, a new solution, one based on the assumption that the dividing line is a boundary at which the vortices equal zero.

Thus quantitative estimates have been made for the first time of the parameters of the Karman streets on the basis of atmospheric pressure variations caused by Karman vortices and on satellite photographs of the cloud cover.

For the first time in Bulgaria, Vl. Sharov and G. Ganev have elaborated and tested an algorithm for vertical probing of temperature in the atmosphere on the basis of satellite data for cases of cloudlessness and a single-layer cloud cover. Bulgaria has thus become the fourth country participating in the "Interkosmos" Program, following the USSR, GDR, and Hungary, in which vertical satellite probing can be conducted. Moreover, Bulgarian scientists have proposed an original method for determination of the absolute geopotential on the basis of satellite temperature probe data. The initial results are highly encouraging; experimental verification is now in progress, and follow-up studies will be carried out, in collaboration with scientists of the GDR.

The second scientific sector of space meteorology is rocket probing of the atmosphere. The meteorological rocket data that have been published have made it possible to undertake study of the statistical structure of meteorological fields, a matter of considerable importance in elaboration of methods for objective analysis and forecasting of the weather, optimization of the network of stations for rocket probing of the atmosphere, etc.

The statistical structure of meteorological fields based on data from the worldwide network of stations for rocket probing of the atmosphere was studied for the first time by V. Zakhariev and M. Prodanova. They constructed spatial correlation functions of temperature and wind at the 30, 40, and 50-kilometer levels demonstrating the vast scale of stratospheric processes. They also established that the distance between stations for rocket probing of the atmosphere should be 1000 kilometers. This is an important and interesting finding made by the specialists participating in the "Interkosmos" Program in KOSPAR. Similar statistical studies have been carried out for the temperature and geopotential fields jointly with Soviet specialists on the basis of aerologic and rocket data for the northern hemisphere. The results of these studies were subsequently used in elaboration of a numerical system for objective analysis of meteorological flights in the USSR.

The research on the statistical structure of meteorological fields has been accompanied by the designing of numerical systems for objective analysis of the geopotential field in the stratosphere. In Bulgaria, V. Zakhariev and L. Gaytandzhieva have designed a numerical system for objective analysis based on representation of the field in a twofold Fourier series. The numerical system has been tested by application of various synoptic situations and has been compared with the system based on the optimum interpolation method in use in the USSR. The 2 systems have been found to be of comparable interpolation accuracy and to be suitable for aplication in study of processes in the stratosphere. In some problems relating to research on the energetics of the atmosphere it is expedient to use both numerical systems concurrently, and for this reason work has

started on design of a combined variant permitting exploitation of the advantages of both numerical systems devised.

In the field of development of methods and means for observations in the middle atmosphere, that is, the layer extending from the tropopause to altitudes around 100 kilometers, IKhM specialists have participated in the development of new dipole reflectors and satellite-borne equipment designed for radar wind measurement by means of the M-100 B and MMR-06-Dart weather rockets.

The M-100 B rocket has been in use for years at all Soviet stations as a basic probing instrument for rocket probing of the atmosphere. It is also in use at the international launch site at Tumba in India, and was recently introduced into Bulgaria. The MMR-06-Dart unified weather rocket is being developed under the "Interkosmos" Program and is designed for use in the rocket probe system of the socialist countries in densely populated areas, that is, by launching from a small area with the engine component of the rocket falling to the ground. Both rocket systems provide the possibility of measuring wind in the mesosphere and stratosphere by means of inexpensive passive radar targets ejected from the rockets, dipoles forming as they drop a cloud whose drift is tracked by special-purpose ground radars.

This method has been applied at various launch sites throughout the world with various dipole models, but the existing models do not assure sufficiently dependable wind measurement throughout the layer investigated, owing chiefly to their unsuitable equilibrium speed of descent in different parts of the atmospheric range extending from 40 to 90 kilometers. For example, some of them descend at a relatively low speed above an altitude of 75 kilometers, but are virtually useless in the denser layers because of expansion and dissipation of the dipole cloud. Conversely, other models are used in the lower layers but in the upper atmosphere reach a much higher speed of descent leading to unacceptably large wind measurement errors. Hence practical application requires dipole reflectors simultaneously possessing the properties of the 2 models referred to.

On the basis of analysis of the aerodynamics of descent of dipoles in a rarefied atmosphere, D. Simidchiev and D. Gaytandzhiev have proposed the use of flat dipole reflectors made of aluminum foil. Because of the change in the aerodynamic nature of the flow around them, these dipoles are characterized by low vertical speed at high altitudes and by a relatively greater speed than the other models in the denser layers. This permits acquisition of wind profile data in the layer extending from 85 to 30 kilometers with a root mean square error not exceeding 10 meters per second. This finding was confirmed by experiments conducted in 1973, 1975, 1977, and 1980 at Soviet launch sites with both rocket types, the M-100 B and the MMR-06-Dart. In all experiments the length of the wind profile obtained exceeded 30 kilometers, the maximum length achieved being 60 kilometers, an accomplishment unprecedented in world practice, according to the results published in this field.

In the process of the work connected with use of the new dipole models and devised and the rocket systems referred to, several alternative actuating

mechanisms and containers have been developed to ensure forced dispersion of the dipoles following their ejection from the carrier rocket. In the experiments conducted, the devices in question permitted location and automatic tracking of a dipole cloud by radar, that is, in a fraction of the time required by the natural dispersion method previously applied.

Along with the equipment in question, a universal system for linking together the assemblies of the DART probe rocket, developed at IKhM, was delivered to the USSR for application. This is of great importance in use of the rocket in populated areas.

The work and accomplishments of IKhM specialists in the program sector in question have been highly rated as contributions to cooperation in this field in "Interkosmos" circles, especially in the USSR. They represent one of the material Bulgarian achievements in this sphere.

One feature typical of the entire Bulgarian space program is naturally also inherent in the field of space meteorology. This is the practical orientation of the research. In addition to their purely scientific value, the results have an immediate practical application for the purpose of improving weather analysis and forecasting.

The basic scientific sectors in the field of space meteorology will continue to be developed in Bulgaria in the future. In keeping with the interests of the country and our capabilities, we continue to participate actively in the "Interkosmos" Program. This guarantees that research will be conducted at a high scientific level and with extensive international cooperation and division of labor.

Particular attention is being devoted to satellite remote measurement methods by means of which the necessary meteorological information is obtained on the condition of the atmosphere and the earth's surface. This is information based on multiple-channel spectral images in the visible, infrared, and centimter regions of the spectrum. In addition, it will be acquired in real or virtually real time, this necessitating the availability of suitable electronic equipment for express processing of data and use of the latter for numerical analysis and forecasting of the weather.

Integrated use of meteorological information obtained by various means (satellites; rocket, aerologic, laser, acoustic probing; ground observations) will aid in improving weather analysis and forecasting. Accomplishment of this task requires elaboration of methods for coordinating different kinds of meteorological information and the use of modern computer systems.

An important task is that of studying the interaction of individual layers of the atmosphere. A number of statistical data are currently available which confirm the existence of interaction and connections between the processes in the mesosphere and those taking place in the troposphere. And this aspect is of great importance in forecasting the weather, especially over a protracted period, and should be taken into account in models of the atmosphere.

As is to be seen, space meteorology not only is of assistance in gaining better knowledge of the mechanisms of the processes taking place in the atmosphere, but is also of immediate value in solving the problem of predicting the weather on different time scales. And this is of great importance to the national economy.

Bulgarian meteorlogists will continue to take the most active part possible in work on the problems of space meteorology within the framework of the "Interkosmos" Program, as well as in practical application of the scientific results obtained.

6115
CSO: 2202/22

ACHIEVEMENTS IN BIOLOGY OUTLINED

Sofia VECHERNI NOVINI in Bulgarian 18 Aug 84 p 4

[Article by Senior Scientific Associate Georgi Petkov, vice director of the Center for Biology at the Bulgarian Academy of Sciences: "Biology: A Strategic Direction"]

[Text] Bulgarian biological science has experienced an incredible upswing during the last four decades. The victory on 9 September opened up broad horizons for its development in all directions. New structural institutes were created, the potential of the cadres increased manifold, the material base improved, great scientists, esteemed not only in Bulgaria but also abroad, established themselves (academicians A. Khoadzhiolov, K. Bratanov, R. Tsanev, R. Popivanov, T. Tashev, At. Maleev, M. Dakov, and others).

The opening of a number of new institutes and central laboratories created possibilities for profound, fundamental research on a number of new biological trends, such as molecular biology, genetic engineering, biochemistry, biophysics, genetics, ecology, industrial microbiology, biotechnology, biological instrument building, and others.

Fundamental research in the area of medical biology has contributed to the health care and prolonged creative longevity of Bulgarians. The scientific developments at the institutes for agrobiology became a scientific base for agricultural intensification and for developing biotechnologies and their application in life. The institutes and laboratories with an ecological orientation contributed much to the discovery and rational use of biological resources in our country and to preserving and restoring the natural environment.

In general, over the course of the last 40 years the biological front in our country has become more compact, especially during the last decade; it has established strong and beneficial relations with the chemical and medical industries, agriculture, and the forest industry.

It is impossible to describe all the achievements of biological science in such a short space. I would like to mention only a few of them here. For example, the developments in studying the structure and functions of nucleic

acids and proteins, solving the nature of all regulatory mechanisms and the transfer of genetic information in plant and animal cells, represent a particularly great achievement in fundamental biology. Serious theoretical studies of carcinogens have been made. These achievements have laid the foundations for other studies in the field of genetic engineering, which contributed to the deployment of contemporary biotechnologies in our country, such as hybridomous biotechnology for obtaining monoclonal antibodies with a revolutionary impact on the production of biopreparations for human and veterinary pruposes; a method for transplanting heterozygotes, which is extremely important for human medicine and especially for livestock breeding, has been introduced. The technology of cryoconservation of vital cells and tissues that have a broad application in the reproductive process of humans and animals, as well as in surgical practice, has been adopted.

Agrobiology, and more specifically genetics, has made significant achievements in the field of heterosis, (aneuploidiya), remote hybridization, implementation of cell and tissue cultures, etc. This has created possibilities for introducing many new tomato, wheat, corn, pepper, tobacco, and other hybrids in agriculture, which have high genetic capabilities and can be compared with the best foreign hybrids in terms of quality and productivity.

On the basis of comprehensive, fundamental research at the Unified Center for Biology, original apparatuses for the intensification of biological research were created: a family of laboratory microprocessor-controlled fermentators, which can be used in scientific activity as well as biological industry, and the Spektroskan-182 speed spectrophotometer. Both devices at the Bulgarian People's Republic National Exhibition -- 40 Years of Socialist Progress -- held in Moscow; the Scientific Research Laboratory for Instrument Building and Automation of Continuous Productions at the Bulgarian Academy of Sciences was awarded an honorable mention.

During the studies of the effective use of biological resources in our country, the chromsome profile of the caryotypes of 166 plant populations was established, including 10 new ones for scientific purposes. Nine volumes of "Bulgarian Fauna" have been published. Over 430 kinds of invertebrates in southwestern Bulgaria were established, 19 of which are new kinds of animals found for the first time in Bulgaria. The natural potential of forest ecosystems in the mountains has been established. A complete ecological characterization of plant resources has been made and directions for their effective use have been developed.

These brief data show that biology is on the upsurge in our country. The April Plenum of the Central Committee of the Bulgarian Communist Party and the subsequent resolutions of the Central Committee for developing biological science in our country, which serves as the starting mechanism for developing a number of strategic and priority trends in biology, gave a particular boost to its development.

We will become witnesses to the overall development of biology in the future because it is a science that studies life and serves life.

12334
CSO: 2202/23

ECONOMIST CAUTIONS AGAINST OVERCOMMITMENT TO MICROELECTRONICS

East Berlin WIRTSCHAFTSWISSENSCHAFT in German No 3, March 1984, on pages 381-392 carries an article, entitled: "Information, Information Technology--A Special Element of the Productive Forces", questioning the role of information technology as the "core process" in the "scientific-technical revolution." For text see ECONOMIC AND INDUSTRIAL AFFAIRS, JPRS EAST EUROPE REPORT: EEI-84-050 of 2 May 84 pp 1-14.

CSO: 2300/378

BRIEFS

MICROELECTRONICS PRODUCTION INCREASING--Production of microelectronic products in the GDR has increased considerably since 1978. The manufacture of microelectronic components based on value rose in 1978 from 1.7 billion marks per year to over 4 billion marks in 1983. The number of integrated circuits in 1980 rose from 38 million to 59 million in 1983. Within the same period of time, yearly production of microcomputers grew from 3100 to more than 20,500. [Text] [Magdeburg VOLKSSTIMME in German 24 Sep 84 p 1]

CSO: 2302/28

STRICTER CONTROLS FOR NUCLEAR FACILITIES

Budapest MAGYAR HIRLAP in Hungarian 8 Aug 84 p 9

[Interview with Jeno Galosfai, chief of the regulatory department in the Ministry of Construction and Urban Development]

[Text] Decree No 11/1984 of the Ministry of Construction and Urban Development concerning construction of nuclear facilities appeared on 1 August. The regulation of planning and construction is not something new, but the present regulations are stricter and more detailed than the 1980 law concerning nuclear energy. We asked Jeno Galosfai, chief of the regulatory department in the Ministry of Construction and Urban Development, why it was necessary to reformulate the decree.

[Answer] Because of the special character and dangerous nature of nuclear facilities and because a number of such facilities began operation recently--educational and research bases and hospital laboratory equipment, in addition to the Paks Nuclear Power Plant. Because of these things the concept of nuclear facility has expanded also. It now includes every installation where more than one kilogram of fissionable material is used. The 1980 nuclear law applied only to nuclear power plants. So regulation had to be adjusted to the present.

[Question] What is the essence of the new decree?

[Answer] A strict quality control system is being put into effect on the basis of the model of the construction of the Paks Nuclear Power Plant. This should specify, despite the differing sizes of nuclear facilities, when planning and construction are more strictly controlled than they are by the regulations otherwise in effect. After repeating the generally valid construction regulations, it contains special prescriptions. For example, that building design and construction assembly work on facilities connected with nuclear installations can be done only by technical design or contracting units to which the minister of construction and urban development has given a permit to do so. Before beginning the task all building, assembly and technical planning documentation must be compiled, which also is fixed by separate prescriptions.

[Question] Builders frequently complain about the regulations, saying that they tie their hands, they can hardly work because of them. Will there not be such a problem with the new decree?

[Answer] As I mentioned, the regulation was prepared on the model of the contracting practice for the Paks Nuclear Power Plant. If they did not find safe construction an obstacle there then it will not be superfluous for smaller installations either.

8984
CSO: 2502/87

EXPORT CONTROLS BAR SUCCESS OF 'PSYCHOCALCULATOR' OF USSR SPACE MISSIONS

Budapest MAGYAR HIRLAP in Hungarian 15 Aug 84 p 7

[Article by Peter Vanicsek: "Hungarian Stress; Medicor Would Manufacture It, But...; Entrepreneur With Money Sought"]

[Text] It is futile to have a good idea, a new product, if there is not enough money for manufacture. At such times a manager with plenty of capital could help affairs a lot, but if he has misgivings too then the prospects are most uncertain. Or are they? In any case the Stress Manager deserves a better fate....

We should keep an eye on those of our compatriots "torn away into the distance" who announce that they are ready to help our economic and business aspirations....

American Hungarians presided over the appearance of the Rubik's Cube as a Hungarian cube. Well, now a new "cube" has appeared. Its name is Stress Manager. Medicor developed it. In their more optimistic moments the hoped for American partners refer to it as a "second Rubik's Cube."

The story goes back to the times among the stars. The reaction time testing device developed within the framework of the Interkozmos program made its debut at the time of the flight of the Balaton and Bertalan Farkas. And not badly either. It called to itself the attention of the experts. Soviet experts talked about it most recently on the occasion of the flight of the Savitskaya. So Medicor prepared a simpler civilian version of the device, the Psychocalculator. The little computer combines in itself a measurement of various reaction times and would provide information on emotional and physical states. Would...! The measurement method was not developed for this. That is, a uniformly accepted interpretation of the data measured was lacking. Because it is all right that my reaction time and pulse are thus and so, but the question is: Compared to what? The problem is about the same as if we tried to sell a measuring tape without dividing it into centimeters.

"Despite its undisputed utility we were not able to sell the Psychocalculator," said Janos Stark, business official for Medicor, "because much money and time would be required to work out a scientifically founded and internationally accepted methodology. And there was no money because we did not succeed in selling them in large numbers..."

Great Enthusiasm

The circle is closed. Nor does the Psychocalculator belong to the front rank of the product structure of Medicor. It might have. It took from 1978 to 1981 to make a commercial product out of it.

Then in 1982, only "by chance," it was mentioned in a business conversation and Laszlo Beresh, director of an American enterprise called U.S. Trade Research, jumped at the idea. "You have again invented an ingenious thing," he enthused, and talked about cosmic numbers of sales. You only have to bring the price down, the experts were advised. This happened in February. In April Zoltan Kasa, developmental engineer for Medicor, traveled to the United States and--World, behold a miracle!--in August the first three examples of a commercial version, the Stress Manager, were ready--hand made, however.

In its more playful form the new calculator contained all the functions of the professional version. The basic program, the Face, provides approximate information concerning the mental, physical and emotional state of the person being tested. One can judge the mental condition by measuring reaction time, among other things. Four little lamps flash, apparently at random, and one must press the buttons under them every time they flash. The machine records the time for this and the number of mistakes and this indicates the signal processing ability. But so that the task should not be so simple sometimes there is a sound signal at the same time the lamp lights up. At such times one must not press the button. This indicates the signal selection ability, the degree of concentration and volitional inhibition.

The second test is a Bio-feedback program, which tests emotional balance. The increasing or decreasing resistance measured on the skin indicates changes in the tranquil or agitated state. The essence of the test is that first, with methods of autogenic training, one must relax, become tranquil. A sound signal generated by the skin resistance indicates this. If the sound is deeper we are relaxed; if it rises we are more agitated.

In the third test one must do a number of deep knee bends which the machine determines according to age, height, weight and sex. It measures the heart beat accelerating with the deep knee bends and then, after one minute reaction, the abatement of the pulse. From this one can determine the physical state. The data received are evaluated as a deviation from the average and a classification of good, average or bad is given. But it can be given as a percentage too, so one can measure deterioration or improvement. Since there was still room in memory they built in various games too. And all this could have been sold at a price of $100.

No Protection

Of course... not in Hungary and not from Hungary, because the discriminative restrictions and high duties would have increased the price of the electronic parts, the chips, so much--if we could get them at all--that the calculator would be too expensive, thus unmarketable. Using parts from socialist countries would have made marketing impossible also due to the restricted variety, the long and uncertain delivery times and prices 3-5 times higher.

So director Laszlo Beresh tried to bring in the venture capital. Not much would have been needed. Production could have been started for $1 million; indeed, this would have been enough for advertising and market work too. Unfortunately his efforts did not succeed. In no small part because there was no patent protection. If the "deal" had gone through and the Stress Manager became popular then in two months the Japanese, Taiwan and Hong Kong competitors would have come out with a "knocked down version" at dumping price complete with alarm clock. It is true that a patent for the calculator was applied for in the United States in 1983, but it will be a good year or two before patent protection is received--retroactively.... By then the dumping goods would have ruined the market and by the time the case reached the international court in The Hague the mobile competitors would have disbanded the enterprises established expressly for this purpose. So whom could one sue then?

A Second Cube?

So far the time being the venture capital remained uninterested even though the little toy was "most pleasing" to the owners of it personally. Now Medicor is seeking new partners--who have appeared, but for the time being only preliminary discussions are under way. Manufacture could begin in 3 months, if there is capital. So one could exploit the Christmas possibilities even this year, although the star of the really "big deal," jogging and aerobics, to which it could have been offered as a supplement, has set already. But the deal is not yet lost forever.

"What is most annoying is that all this does not depend on us," complained Zoltan Kasa, the developer.

It appears that it really does not! And will it be a "second Hungarian cube?" We can only draw for ourselves the bitter lesson of the old Russian saying that "rubles give birth to rubles, kopecks to kopecks.

MTI Dispatch, Arriving at Time of Publication

Manufacture of a portable reaction time measuring device has begun in Dunakeszi, in the electronics division of the Dukat Synthetics and Paper Industry Small Cooperative. The device, called Konditest, measures one's condition according to how quickly the person being tested presses buttons on the device in response to randomly flashing light signals. The response time or reaction time is displayed on the screen of the device in milliseconds and from this experts can conclude the fatigue or nervous state of the individual.

The device is portable and operates on a 9-volt baterry, so it can be used to test vehicle drivers on the spot.

8984
CSO: 2502/88

SERIES PRODUCTION OF COMPUTERIZED SYSTEM CONTROL DEVICES

Budapest NEPSZABADSAG in Hungarian 17 Jul 84 p 5

[Text] Series manufacture of a domestically developed computerized system control device has begun in the Electronic Measuring Instruments Factory. The equipment includes four microcomputers, a picture screen display and magnetic disk background store and special printer write-out equipment and standard measuring devices can be attached to it. The computer, the programming language of which is the widely used BASIC, is also suitable for technical-scientific calculations, computer assistance to engineering design work and control of complicated, automatic measurement systems.

The first 30 of the EMG 777 devices were prepared last year; the testing was successful and so series manufacture has begun taking the experiences into consideration. According to the experts the actual possibilities for using the computer, developed domestically and containing few parts coming from capitalist countries, have not yet been really measured. At present the users--for example, in the National Measurements Office and in the Electric Industry Research Institute--are using it primarily for control of measurement systems. The equipment can be used well also for computerized design. In the Heat and Systems Technology Institute of the Budapest Technical University, for example, they are performing thermal technology dimensioning of various electronic devices with the device. The special computer program package belonging to the device can be used in many areas of engineering work. It makes possible the computerized spatial designing of various bodies--for example buildings--and displays the designed object on the screen.

The equipment will be put into operation by domestic users in the immediate future but they are also talking about foreign sales.

8984
CSO: 2502/87

BRIEFS

NUCLEAR POWER PLANT EQUIPMENT--The Kiskunfelegyhaza factory of the Fourth of April Machine Industry Works has undertaken to manufacture nuclear power plant equipment posing requirements of extraordinary precision and high quality in every respect. In a plant specialized for such equipment within the framework of CEMA integration manufacture they have created the necessary technical conditions and trained the experts. Now, in addition to satisfying domestic needs, they ship their products to the Soviet Union, the GDR and Bulgaria. Photo caption: Equipment being prepared in the plant. [Text] [Budapest NEPSZABADSAG in Hungarian 20 Jul 84 p 5] 8984

CSO: 2502/87

FIBER OPTICS DEVELOPMENT, PROSPECTS ASSESSED

Fiber Optics Research, Development

Warsaw PRZEGLAD TECHNICZY in Polish No 29, 15 Jul 84 pp 14-15

[Article by Bogdan Marks: "Perspectives and Possibilities of Optic Fibers"]

[Text] Until recently, little has been said about the transmission of optic signals by optic fibers either in the world or in Poland. The last few years have seen many changes. This new field has been most significantly developed in the leading countries of the West and also in socialist countries, including Poland.

Leading countries in this technical field have applied optic fibers with complete success in such areas as telecommunications, radar, medicine, and electronic computers. In Poland, optic fibers have found practical application chiefly in civil telecommunications and in radar for army use. The development of fiber optic techniques is being carried out in Poland on the basis of domestic facilities and certain raw materials. It must be added that in recent years there has been the feeling that the chemical industry, which is concerned with the production of the basic raw materials for the manufacture of optic fibers, has not received sufficient investment.

The classical fiber optic conductor, somewhat thicker than a human hair, is constructed of a core made from high-grade fiber glass with a protective coating of plastic material. Its thickness depends primarily on the technology used in the production; this also determines the mechanical stability of the conductor. The basic material for the manufacture of optic fiber is quartz glass, which is produced with the use of quartz, a fossil mineral which is commonly available. The problem for physicists involved in this area is how to eliminate from the quartz those impurities which have a negative influence on the quality of the future product--optic fibers. This matter is most essential, since it is the purity of the optic fiber that determines the quality of the optic signal transmitted; if the characteristics of the raw material are bad, the signal can be damped inside the cable. This set of problems is of interest above all to applied research physicists. They are discussing the possibility of transmitting at the same time and on a single optic thread several tens or even hundreds of telephone conversations.

Research

Research on the elements of optic fiber systems and their application in specific areas of our life is carried on in optoelectronics. Scientists of this profession are concerned chiefly with experiments on optic fibers, optic-fiber cables, sources of light transmitted to optic-fiber conductors, photodetectors and photoelectric circuits and sensors of all sorts. Fiber optic techniques and engineering are the object of study of several scientific research institutes, including the institute recently visited by us, the Jaroslaw Dabrowski Institute of Engineering Physics of the Military Technical Academy [WAT], which is studying the application of optic fibers to military use.

On the matter of civil telecommunications, several institutes are working, including the Institute of Communications in Miedzeszyn, near Warsaw; the Institute of Telecommunications of the Warsaw Polytechnic; and the Institute of Electronic Technology, in which Prof Bohdan Mroziewicz has been conducting his work on sources of light that are exploited in this field (DEL and lasers). Significant achievements have also been made at the Marie Curie-Sklodowska University [UMCS] in Lublin, where for years the problem of optic fibers has been studied by the dean of optic fiber technology, Prof Andrzej Waksmundzki. An essential role in the area of research on optic fibers is also being played by the Institute for Principles of Electronics of the Warsaw Polytechnic.

The scientific institutions mentioned are working on different aspects of this question, according to plan. All work is coordinated by the Committee of Electronics and Telecommunications of the Polish Academy of Sciences that is directed by Prof Bohdan Paszkowski; in particular, optic fibers are the concern of the Optoelectronics Section.

Significance of the Problem

The significance of optic fiber technology is demonstrated by the fact that this topic is found in government program PR-3, which concerns the application of electronics in the nation. Toward this end, the Council of Ministers has recently allocated significant financial means, thereby stimulating the development of research on lasers and optic fiber sensors. A second advocate concerned with the problems of fiber optic engineering in telecommunications is the Ministry of Communications, which is viewing the future of telecommunications in this new technology. It will suffice to remark that the optic fiber thread from a glass fiber is significantly cheaper than the traditional heavy cables made from nonferrous metals which we lack; moreover, the fibers make the construction of miniature equipment possible. The practical manufacture of optic fiber cables is being studied by the Center for Optoelectronic Technology in Lublin.

The Future

The possibility for the broad application of optic fiber threads in different areas of technology and for military use shows that there is a great future

for optic fiber engineering. Their small dimensions and the new technology of manufacturing from quartz shows that in electronics it is possible to effect significant savings of nonferrous metals, such as copper, aluminum, lead, and tin, which are used in the production of traditional telecommunication cables.

The new technology will certainly be applied, not only in the areas mentioned but also in other areas, for the benefit of all society.

[photo captions]

1) Naval Capt (Prof) Mieczyslaw Szustakowski and Engineer Wieslaw Ciurapinski testing the operation of a photodetector scale made for the first time in Poland.

2) Col Tadeusz Patej measures the optical characteristics of the optic fibers used at the WAT Institute of Engineering Physics.

3) Engineer Maria Wisniewska and 1st Lt Kotlowski inspect an optic fiber in the process of making it.

4) Lt Col Stanislaw Masternak and Engineer Kosielski performing the measurements of the parameters of a fiber optic line.

Problems in Fiber Optics Technology

Warsaw PRZEGLAD TECHNICZY in Polish No 29, 15 Jul 84 pp 16-17

[Article by Jan Fijor: "Attenuation of Optic Fibers"]

[Text] If Prof Andrzej Waksmundzki of the Marie Curie-Sklodowska University [UMCS] in Lublin is the "father" of Polish fiber optics, then its "grandfather" is Prof Zenon Szpigler, former chief of the Institute of Communications, later faculty member of the Warsaw Polytechnic. There is also a Prof Adam S. from the Polish Academy of Sciences, who is himself regarded as the father, but people from the branch say that this is a "strong exaggeration," although it is precisely he who is a link between the quiet laboratory at UMCS and the "wide world." He travels to symposia, makes presentations, advises....

It would have been an injustice to call Prof S. a usurper. He really was the first in Poland to work with optic fibers, although the results from his work were not great. On the contrary, if it were not for the protest of several hobbyists, apparatus would have been bought on the recommendation of Prof S. for many thousands of dollars that was later made in Lublin. Why optic fibers in Lublin? By accident. Here they were able to draw capillaries which were long and good enough. And so it occurred to Prof Szpigler--today he is already a scientist emeritus--that from capillaries to optic fibers is no great leap. And he was not mistaken. Already in 1978 the team of chemists under Prof Waksmundzki was working out the first original Polish technology for the production of optic fibers. We were at that time approximately 3-4 years behind the United States and Japan.

At more or less the same time the Bell Corporation in the United States was working out the sensational MCVD method (the technical details will not be recounted, as this is a job better left to specialists), toward which the workshop of Prof Waksmundzki was inclined. This method provided an opportunity for producing optic fibers even under primitive conditions such as prevailed in Lublin. Prof A. Waksmundzki had the good fortune to have, among the chemists studying optic fibers, a pair of jacks-of-all-trades, "golden hands" like Andrzej Gorgol and Jan Wojcik, who are knowledgeable in electronics, mechanics, cabinet making, and surely in garment cutting and needlework as well. It must be assumed that the basic motive which inspired this group to perform effective work was the provincialism of the center. Far from the capital, foreign literature, those neon lights, portraits and medals--"We'll show them!", "Lublin will do it!" Thus, after developing the technology of optic fibers, they began demanding the mobilization of production. Bascially, they should not have been concerned about it, but...

They Succeeded

In February 1979, another fanatic on the subject, the engineer Stanislaw Zbyrad, appeared. A marvelous organizer, an active, able man... At the same time, Lublin obtained the powerful support of the then minister of communications, Prof Edward Kowalczyk, who found a pretext, or rather the means by which optic fibers could be placed in the investment program of the agency. It must be remembered that the year 1979 was the apogee of the economic maneuver and the minister could decide on investments which did not exceed a value of 100 million zlotys. The minister took the inventors by the hand, supported their efforts, and observed the technical side tolerantly. As a result, for example, the equipment and machines were not included in the cost of the investments. The building (which is only the first stage of the undertaking) was recognized as a ready-built facility; in a word, it could be built, despite difficulties. Director Zbyrad found for himself, through only well-known methods, the processing capacity, construction materials and money. As an impediment to rapid mobilization of production, there was--as those people favorable to Zbyrad say--August 1980 and its subsequent implications, because the majority of co-producers, contractors, and sub-suppliers, whose favor he had earned, changed directors after December of 1981, and it was necessary to blaze new trails...

What had happened--in spite of all difficulties--in the building of the "Center for Optotelecommunications Technology" in Lublin at 7 Energy Workers Street was, by the standards of our country, an event. It was a near thing, but the road from conception to inception had taken not quite 3 years! Such speed would not have embarrassed Hewlett Packard or Sony, but what about for the first time in Poland in the "eye" of a crisis...

Thanks to the exceptional attitude of the team of scientists from UMCS and the efficiency of Director Zbyrad and his right hand and partner, Engineer Roman Burlikowski, they secured machines and equipment, they built a shop for the production of optic fibers; all of this was put into operation by the end of 1983, i.e., in less than 4 years. Even the Institute of Communications, which is the first-level coordinator of the "problem of

optic fibers," was amazed by this pace. Two years ago its director, Andrzej Zielinski, said that "a cactus would grow on my hand" if this project succeeded.

Not only did it succeed, but the Institute of Communications did what it could so that the growth of the cactus would not occur...

Quarrels and Envy

The Institute of Communications, if it had been able, would have worked out a technology of optic fibers by itself. It was not able, but in spite of this fact it is all-powerful with regard to those decisions concerning optic fibers. On what grounds? After all, along the administrative line or in substance they are still quite a distance from Lublin. Who cares about Lubliners when they have to beg, practically on their knees, in Warsaw for the purchase of 1 kg of heat-resistant lacquer (the Ministry of Foreign Trade can promote 20,000 tons, but not a kilogram), a small screw, a scientific journal, money, etc. If the Institute of Telecommunications could understand what Lublin was asking about, that it is appropriate, they would not have impeded the transfer of that few cents or, more to the point, the money for research would have been there. "They are restraining our initiative. They are hedging their bets, they are suspicious, because they are incompetent," says one of the employees of the center while concealing (in hopes of not worsening the affair) his identity. He also mentions a particular individual, Dr Julian K., who is responsible for the establishment of unwarranted obstacles. If the affair between Warsaw and Lublin had turned out differently, it would already have been possible 5 years ago, for example, to buy in the United States a device for measuring attenuation by the reflection method (extremely indispensable). However, the institute delayed the disbursement of funds until the sanctions were imposed. Who knew when the devices would again be obtainable? The Institute of Telecommunications knows how to do this and wants to do it, but only on a laboratory scale of 2-3 units, when we already need 15 units. In 1981 the CEMI [Scientific Research Semiconductor Center], in spite of the plan and the distribution list, produced a prototype pulse laser for the needs of the Lublin Center. Subsequent units--no one understands why--will not appear until after 1987, for they are already found in plans and distribution lists. CEMI--that Warsaw institution--is competing with Lublin rather than cooperating with it...

The most painful lack is felt in the area of the "light" sources. The Institute of Electronic Technology had undertaken the production of "0.9" and "1.3" diodes even before they knew about optic fibers in Lublin. Until this time, there had been no diodes or detectors, not to mention modern light sources, massively applied around the world, i.e., lasers. In order to "tweak" their colleagues in the capital, the preparation of "sources" was assigned by the Lubliners to the Institute of Physics at UMCS, which had undertaken the production of the diodes mentioned above. After 1.5 years, negotiations were interrupted; the Institute of Communications had placed such bureaucratic barriers, had made such diffuculties, that the scientists from UMCS, rather than bow to the bureaucratization, simply

abandoned everything. The solitary positive result of this sad affair is a minimal increase in the rate of work at the Institute of Electronic Engineering in Warsaw. Their rate is, however, still slow...

Finally, the matter of "sources" for optic fibers was of interest to the Institute of Physics at the University of Wroclaw. They wanted to make "1.3" diodes with their own hands. This required only 2 million zlotys, which the Institute of Communications did not want to give; evidently there was to be a financial competition with the provinces...

The basic complaint against our national style of administration in science and engineering is the lack of balance between responsibility and decision-making authority. Those who can make decisions will not take responsibility for the decisions, and vice versa--the greatest responsibility is laid upon those who have no influence on anything. In the case of the optic fibers there is also the element of so-called competence. The Institute of Communications makes the decisions for which the responsibility falls on Lublin. In Lublin they know what to do, how to do it, and they want to perform efficiently, but the Institute of Communications, owing to a lack of responsibility and competence, complicates the matter. I realize how greatly I am antagonizing the staff of the Institute of Communications. However, people involved in the problems surrounding optic fibers unanimously point the finger of guilt for such significant delays.

These mechanisms explain why our electronics, in the stage of its formation, has fallen short of the international standard for 3-5 years and is now 30 years behind! Administrative rule in science is how to control the weather administratively. When will we work out, at long last, a sensible model based on confidence in people of science (after all, this relates to all areas of life)? If we entrust to someone apparatus worth several million and the intellects of young people, then should not they really decide themselves what they are to do? I hazard the conclusion that if the Szpigler-Waksmundzki-Zbyrad team had had freedom of decision, we would have been producing optic fiber cables for 2 or 3 years now. Meanwhile...

All kinds of conferences are being organized on the theme of applications; reports are being presented on how many tons of copper are saved by fiber optic cables, how many fewer amplifiers, relays, etc., were necessary. How much our telecommunications could have been revolutionzed by fiber optics, etc., etc. Everyone applauds, they are all for it, sure; they do not see, however, any relations between these effects and the rapid initiation of the production of optic fibers in Lublin.

While Awaiting the Decision

The humility of the Lublin "fiberopticians" is worthy of praise. They do not want the Institute of Communications to be stripped of its authority as first-level coordinators. They ask only that their work not be made difficult, that there be no delay with decisions, that they not be slowed down, but that they even be helped out a little at times. Unfortunately, in my opinion, this humility borders on naivete. In science, and engineering,

there must be mechanisms which act to eliminate stupidity, nepotism and incompetence. We must make up our minds once and for all. Since the minister has the authority to suspend college presidents, let him decide on the suspension of a group of people who are delaying the good work of others to the detriment of the country and the whole of society...

Let the Lubliners not be offended by me here; I am sincerely and to the end on their side. I must, however, repeat that they are behaving in an illogical manner.

"Do not, God forbid, write anything bad about Warsaw," said one of the engineers to me, "because then they'll get even angrier over this matter of the fibers."

"What do you have to do with it?" I asked.

"Nothing, but that's the way if a man...should want something...You know, personal satisfaction," stammered the speaker. He mumbled something more about patriotism, obligations with regard to the fatherland...

In Warsaw, there are no such problems. They can count on Lublin. If, for example, they delay the production of some necessary device or machine, Lublin will undertake its production. In this manner they relieve the institutions which are responsible in the "state program" for their assigned duties. For it is in the best interests of the Lubliners, after all...

The Institute of Communications solves, and well, many curious and at times even sensational problems; it is just that it cannot cope with the "ordinary" optic fibers. "Recently, very good work has been done by the telecommunications laboratories of each Postal Directorate. They have good practical preparation, so it may be that they can be entrusted with the problem of investigating fiber optic technology." So thinks Engineer Burlikowski. Perhaps. But at this point it is necessary to make a decision. Decide, but let it be quick...

In 1976, as I have said, Polish optic fibers were sensational. Thanks to a group of people, due to technological curiosity--if only it had remained, without the fanatics, up to the present day--these optic fibers were transformed into a sought-after product. Electricians from the Lodz Postal Directorate pray that fiber-optic cables will be extended in their area. An already-existing experimental segment, 5 km in length, has not required any repairs, overhauls, or maintenance, but has been working exquisitely. The Anglo-French airplane Concorde, thanks to the use of fiber-optic cables, is lighter by approximately 20 tons than it would have been with copper wiring. Optic fibers have applications in medicine, e.g., for observation during catheterization; in mining, for the observation of the effects of subterranean explosions; in teletransmission, telecommunication, aeronautics, etc., etc. It is being said that in 10 years the whole world will be equipped with optic fiber cables, and this fact will revolutionize technology. It is already imperative to reflect upon this fact today, all the more since optic fibers will eliminate the use of

copper wiring and the demand for copper will fall. And after all, we export a great deal of copper. Let us spite ourselves and begin to make competition for our own copper. Just by making optic fibers...

Several years ago, when the technology for "made in Poland" was ready here, they were not even dreaming about the possibilities for optic fibers in Bulgaria. Now, only several weeks ago, a delegation of scientists and engineers from Sofia, Bulgaria, were guests in Lublin, and they boasted that this very year they would begin the production of optic fibers under a Japanese license. We would not have to buy a license, thanks to which several million dollars would be saved. Is it really necessary to waste money?

If the administrative style with regard to optic fibers does not change and UMCS and the Center for Optotelecommunications do not find the proper support, in 15 years or so everyone will be able to make himself a large noose of the copper wire which no will be buying from us. And this is not just journalistic pessimism...

12469
CSO: 2602/39

RAPID DEVELOPMENT OF BIOCHEMISTRY OUTLINED

Warsaw RZECZPOSPOLITA in Polish 4-5 Aug 84 p 4

[Article by Prof Wlodzimierz Ostrowski, member of the Polish Academy of Sciences [PAN], scientific secretary of the Krakow Division of PAN, and chairman of the Biochemistry and Biophysics Committee of PAN: "Progress of Biochemistry"]

[Text] The remarkably rapid development of biochemistry in Poland began when a system of coordinated research was introduced, that is, at the beginning of the 1970's. It is precisely in this period that extremely dynamic advances were made worldwide in biochemistry and molecular biology and it was recognized that the latest achievements in this area might soon be of suitable economic advantage.

The development of enzymological research and, in particular, knowledge of the properties of the so-called immobilized or insoluble enzymes significantly broadened the use of biological catalysis in drug production, and in the food, chemical and power industries. Another critical point was the introduction of genetic engineering into basic research and technological practice, which required different cells, chiefly microbes for the synthesis of needed proteins, enzymes, hormones and other important useful agents.

These spectacular worldwide discoveries in biochemistry at the beginning of the 1970's also shaped the views of our biochemists, influencing the accepted research plans for the next decade. As a result of detailed discussions held before the Second Congress of Polish Science, it was established that the investigative program for the first 5 years of coordinated research would include "research on the genetic information of microbes, plants and animals."

The Race To Be First

During the 1970's, thanks to the integration of many research teams nationwide (directed by the team coordinating the above-mentioned program), important results were obtained concerning the structure of the genetic apparatus of microbe and plant cells, as well as new data about the structure of natural nucleic acids and those obtained by artificial synthesis.

The development of enzymological research, along with crystallization of some enzymes, research on the processes of controlling the snythesis of proteins and nucleic acids, on the structure and function of cell membranes and on the energetic changes of the cell, had worldwide significance. Toward the end of the 1970's and the beginning of the 1980's, these trends were fully developed for a thorough recognition of the genetic apparatus and mechanisms of gene expression at the molecular and cellular level. In the area of enzymatic processes and metabolism, efforts were aimed at the applicative value of this research, especially concerning the use of enzymes in the pharmaceutical industry, environmental protection, and for diagnostic purposes in medicine. Separate departments of biophysics, primarily molecular biophysics and the biophysics of various biological systems, were set up.

Our scientists' numerous works published in the most renowned international journals are a measure of the achievements in the above-mentioned departments of biochemistry and biophysics. Also significant is the contribution of Poles to team research conducted in the institutions of socialist countries, as well as capitalist countries, chiefly the United States, West Germany, Japan and France.

Throughout the entire 40-year history of the Polish Peoples' Republic, biochemistry in Poland has developed without major upheavals and with a positive effect on both the economy and the public's general biological education. The achievement of significant progress in this field was very important for the integration of all biological sciences, since biochemistry fulfills the same connective role among biological sciences as physics fulfills among the hard sciences.

Just after World War II, barely a dozen or so poorly equipped, understaffed biochemical institutions existed in Poland. But in the 1960's there were already over 50 of these institutions, and today we have roughly over 100. Mechanisms for control of research in this field have also been improved. Besides the Biochemistry and Biophysics Committee of PAN, which initiated the main research trends at certain stages of development of biochemistry after the war, the Polish Biochemical Society has played a large role in the development of Polish biochemistry. The society originated in 1957 and today has over 1000 members in a dozen or so agencies. The organization of scientific meetings and nationwide symposiums, superior labor competitions and advertising campaigns have brought in many capable young people, who are now the core of the research teams in the PAN institutions, institutions of higher learning and departmental institutions.

New Problems

At present Polish biochemists are faced with new problems to solve. This results from the fact that Polish society, as well as all of mankind, is faced with three universal problems with which science must grapple. These are: energy sources, food and health. There is a general opinion that modern biotechnologies may contribute much to the solution of these problems.

Everyone knows that biotechnology is a simple consequence of the dynamic development of biochemistry, molecular biology and biophysics in recent decades. Therefore, biotechnology as a field of interdisciplinary basic research and a recipe for modernizing many branches of industry by reducing production costs, decreasing environmental pollution and obtaining those products which formerly were difficult to obtain has become the order of the day in many nations in the East and West, and in developing nations.

It must be emphasized, however, that the path of applying biotechnology will not be easy or rapid. This is based on a useful report compiled under the direction of the Biochemistry and Biophysics Committee of PAN and approved by the presidium of the Polish Academy of Sciences on 27 March 1984. Above all, appropriate organizational efforts will be essential at the scientific, industrial and administrative levels. It will be necessary to organize precisely selected basic research, especially in the areas of enzymatic and genetic engineering, select useful microbial grafts and build appropriate equipment required for research and production on a semitechnical scale.

It seems to me that we should focus our attention on the preparation and modification of various enzymes from natural sources, which will be used more and more in daily life because of their exceptional catalytic properties, which may be used in the production of drugs, food products and power materials.

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ENVIRONMENTAL POLICY, STANDARDS ASSESSED

Environmental Protection Tasks

Warsaw AURA in Polish No 8, Aug 84 pp 3-4

[Article by Barbara Prandecka: "Directions of Poland's Environmental Protection Policy"]

[Text] The highly unsatisfactory state of the natural environment in Poland and its continual deterioration have given our national economy the urgent tasks of protecting the environment and the human population. These are difficult tasks since they require such extensive enterprises as:

-- the repair of that which has been excessively destroyed, polluted or poisoned;
-- continuous activity to counteract the further degradation of all elements of the environment;
-- and prognosis of the conditions and needs of future generations.

These three particular directions for action are not separate but, on the contrary, they are largely interdependent, closely associated with one another and possess the same goals.

The public's ecological awareness is presently very large although one does still encounter frequent cases of indifference and lack of thought on the part of industrial management.

As more experience in this field is attained, the reform is being gradually improved. This has turned out to be the case because enterprise self-financing and independence has limited any inclination to make investments on environmental protection. This point brings forth several important problems:

-- Mechanisms making environmental protection a profitable activity should be created for industry. This means that we must make our pollution standards, especially those for harmful gas emissions, much stricter and to increase penalties for dust, gas and waste emissions that exceed norms. The aim here is to create an appropriate penalty ceiling to encourage installation of environmental technology. The cost of penalties should therefore exceed the annual costs of payment for and operation of waste-treatment equipment.

Recently, penalties are taking their toll on the profits of enterprises (plants). This in itself is a form of progress since those penalties were previously entered as part of the production costs and even included in planning. Penalties are to be imposed by the organs of territorial administration and may be amortized by the Office of Environmental Protection and Water Management in cases in which an enterprises is unable to meet the established pollution standards. This therefore presents us with a problem that must be settled by our economic policy: how can the new system of management reconcile the conflict of interest between the public and enterprise?

-- The extent of environmental pollution depends on the type of industry and the technological conditions of a given plant. Industries such as energy, steel and iron, chemistry, cellulose and paper, leather tanning and dairy products generate considerably more air and water pollution than, for example, the machine building, shoe manufacturing, candy and milling industries, etc. We also have new industrial plants with closed technological systems and equipment for limiting the emission of gases and dusts or purification of industrial wastes, etc. Other than these, there are also new industrial plants that are very burdensome to the environment as well as old factories in which it is difficult to alter their technological condition or change the production equipment.

From a point of view of environmental protection requirements, some factories tend to enjoy many privileges while others are very hindered by protection standards. In the case of the former, the privileges are very beneficial while the latter suffer financially (due to higher or lower operating costs and penalties). Therefore, it has become necessary to solve the problem in the interests but on the basis of principles of social fairness.

-- The principle of social interests and social fairness in relation to protection of the human environment has made it necessary to set into motion general social systemic mechanisms and the proper instruments of economic policy. The mechanisms should support the new (introduced as a result of reform) system for organization of economic activity, an immanent part of which is environmental protection (and rational use).

However, the catastrophic state of the environment in certain regions and the wasteful use of its elements have made it necessary for the state to make certain decisions and undertake actions. In our opinion, the urgent tasks of environmental protection are as follows:

-- The organization of a large-scale, effective state and public campaign for construction of industrial and communal waste treatment plants (with full-cycle mechanical, biological and chemical treatment). This is a great, outstanding task that must have the necessary resources if we hope to prevent a total ecological crisis (which is worse than an economic crisis) from shaking Poland;

-- Gradual closing down of polluting plants or plant divisions in which the technology cannot be improved or the level of pollution cannot be reduced several times;

-- Immediate (and future) reduction of work in industrial plants emitting above-normal levels of dust and gas that endanger human health and contaminate the soil and food. The reduction in manufacturing output should be suspended once technological changes are implemented or the proper environmental equipment is installed;

-- Growth in the production of full waste treatment plants and components, air protection equipment, monitoring and measuring devices, etc.;

-- Unconditional protection of agricultural land against nonagricultural use. Until 1982, agriculture suffered great losses due to a lack of appropriate programs and voluntaristic legislation giving industrial localization priority in economic policy;

-- Reorganization of urban traffic and transportation technology (communal, individual and transit) in order to reduce fuel emissions;

-- The introduction at institutes of higher learning, and especially economic and technical schools, of course on environmental education as part of economic planning. Present graduates have been, to a large degree, deprived of knowledge in this field and this is one of the causes of such numerous poor decisions that has led to such degradation of the environment;

-- The organization and introduction throughout Poland of long-term collection of secondary products and their remanufacture;

-- Awakening of the economic system to environmental protection as a condition for economic and general social rationality.

This list of what we feel to be the most urgent tasks of economic policy does not yet exhaust the subject. What is needed is a comprehensive, broad program of environmental protection that defines general and special tasks, gives schedules for realization and names the appropriate agents.

In the Sejm's decree on the social and economic plan for 1983-1985 (presented in April of last year), protection of the natural environment was recognized as the subject of state policy. In an earlier (March) decree, the Council of Ministers outlined an economic policy directed at the environmental problems of 27 regions and many cities requiring reduced industrial investments and specific protective measures. This is unquestionably a step forward for the urgent, current and future needs of Poland.

The use of natural resources has consequences reaching far into the future. These resources, the spaces on our planet and the natural environment are limited. Our management of them today must consider the needs of coming generations.

Prognosis defines the shaping of the elements of future biological, social and economic life and the behavior of it respective phenomena and processes as well as their causes and effects. Generally speaking, all of these manifestations of

man's economic activity, especially investment activity, are associated with living space and the natural environment. Economic decisions concerning territory and environment should therefore be based on prognosis and expert opinions on what future effects, positive or negative, of these decisions will be. However, any thinking about the future in an area as complicated as the natural environment and as limited as living space demands a specific approach to prognosis. It is necessary to make a unique synthesis of past experiences and our knowledge of today with an image of the necessity for changes in the future. It is even necessary to be guided by intuition as to what direction changes will take, how the future will shape up and whether it will hindered by current events.

Certain processes and their results are so obvious that it is very easy to conclude what the outcome will be if we do not control them. Among other things, this concerns the negative effects of industrialization and urbanization on human living conditions and the natural environment, the negative effects of civilization on human culture and society and other negative phenomena.

It must also be assumed that some of today's social and political concepts will undergo a certain degree of change. Value categories will change and new categories of needs will arise, especially in the nonmaterial realm. The demand for living space and elements of the natural environment will play a greater role in the future than at any other time now. The public preference for pastoral terrain and woods, the seashore and clean water and air will increase considerably. This will be accompanied by changes in the category of values, costs and profit, etc. Economic assessments will be superseded by socio-economic and social assessments. This will be fostered by public values and ethics for which it seems that the future will hold more favorable conditions.

Environmental Radiation Standards

Warsaw AURA in Polish No 8, Aug 84 pp 24-26

[Article by Marian Czajka: "Protection of the Environment Against Non-Ionizing Electromagnetic Radiation"]

[Text] One of the most harmful factors considered in the 1980 decree on protection and shaping of the environment was non-ionizing electromagnetic radiation. Despite the incomplete knowledge of its effects on man and especially on fauna and flora, the inclusion of this factor in legal regulations for environmental protection must be seen as a progressive measure required from a point of view of public safety. It would not be proper, after all, to wait several years for a full explanation of its effects and passively observe the increase of harmful radiation in the environment.

It would be more justifiable to set up legal barriers now to counteract the effects that we now know about and to make eventual changes in these laws as needed at some later point.

This was the very reason for the inclusion of electromagnetic radiation in the decree mentioned and the publication of some specific legal provisions in another document, the Council of Ministers' 5 November 1980 decree on human and environmental protection against non-ionizing electromagnetic radiation (DZIENNIK USTAW No 25/80).

The present article will attempt to further elucidate the subject of non-ionizing electromagnetic radiation about which so little is known in comparison to other physical and chemical factors. As it seems, the main reason we do know so little about this type of radiation is due to the fact that is specific properties are not directly perceived by our organs of sight, hearing, smell, taste or touch (with the exception of visible electromagnetic radiation to which the eye reacts).

Basic Terms and Phenomena

The harmfulness of electromagnetic radiation comes from the action of mechanical forces on the free and bound electrical charges that are found in the atoms and molecules of all physical bodies and therefore in man. The action of these mechanical forces is characteristic for every electrical field in the environment. An electrical field is formed in turn around any physical body in which a natural or induced change in the arrangement of electrical charges (change of the charge potential or kinetic energy) has occurred. The energy of an electrical field radiated out into space from its source in what we call electromagnetic radiation.

The magnitude of the forces in the field is characterized by such variables as E, the intensity of the field's electrical component, expressed in volts per meter (V/m), H, the intensity of the field's magnetic component, in amperes per meter (A/m) and the density of the power of the field's power as determined by the vector product of both components, known as the density of the electromagnetic field's energy stream, p, expressed in watts per square meter (W/m^2).

We must deal with non-ionizing electromagnetic radiation whenever the energy of the field is too low to induce the ionization of atoms and molecules within the field (too low to break off electrons from electrically neutral atoms and molecules).

Considering the fact that the value of the energy needed to induce ionization is about 10 electron watts and the energy of electromagnetic radiation depends upon the electromagnetic wave length, we can demonstrate that non-ionizing electromagnetic radiation falls within a wavelength of 10^{-8} m.* Therefore, the visible portion of ultraviolet radiation, visible light, infrared, microwaves, radio waves and energy fields of an industrial frequency of 50 Hz as well as the slowly-changing natural fields of the earth would all be considered non-ionizing radiation.

With regard to magnetic field frequency, non-ionizing radiation would therefore fall somewhere between 0 and 3×10^{16} Hz.

Sources of Radiation

As the information above indicates, there are many types of natural non-ionizing radiation that have always been with man. Aside from visible ultraviolet and infrared radiation, there exist other typical electromagnetic fields such as:

-- earth magnetic and electrical fields that are subject to very slow changes that occur over periods of hours, days, years and several years;

-- electromagnetic fields induced by atmospheric discharges of frequencies of from hundredths of a Hz to tenths of a MHz (10^6 Hz);

-- electromagnetic fields caused by solar and galactic radiation in a range of frequencies of from tenths of a Hz to many thousand MHz.

Of course, these fields do not constitute any threat to the environment since they are an integral part of nature and man has become adapted to them through the evolutionary process. These fields do continue to play a crucial role in the regulation of vital and environmental processes. Natural electromagnetic fields form a very low-level background upon which are superimposed artificial, man-made fields that are at least hundreds or even thousands of times stronger. Some of the most well-known sources of man-made radiation are the numerous radio and television stations throughout the world. In this case, the electromagnetic energy is intentionally released into the environment to serve as a means of wireless communication.

The second group of man-made radiation sources consists of high-voltage electrical power plants and high-voltage power lines and industrial, medical and scientific equipment that use electromagnetic energy in technological (heat treatment of materials), physical therapy and surgical processes. When such equipment is operated, electromagnetic radiation unintentionally released into the environment as a side effect of the given process.

Most important from a point of view of environmental protection are the electromagnetic fields that are found in the vicinity of transmitter stations and high-voltage power plants or lines. These will be described later in this article. It must be emphasized that we are primarily concerned with the very near vicinity of transmitters, power plants and high-voltage lines: at greater distances the intensity of these fields is drastically reduced.

The field intensities in the vicinity of industrial, medical and scientific sources can indeed reach levels dangerous to the environment. However, these buildings housing these installations are for the most part isolated from the general public which is prohibited from entering them.

The problem of the danger posed to people by radiation generated by industrial, medical or scientific equipment is principally one of work safety.

The Effects of Non-Ionizing Radiation on the Organism

The key problem in protecting the environment and people against non-ionizing radiation is how to assess its harmful effects. Research on this problem has been conducted worldwide for several years. From the results of research conducted up to now, we know that:

-- the harmfulness depends not only on the level of radiation but also its frequency;

-- at the very same degree of intensity, the harmful effects of radiation increase in direct proportion to its frequency;

-- the effects of radiation and the absorption of energy from the environment can have two primary effects, thermal and nonthermal. The thermal effect increases the temperature in part or whole of a body exposed to radiation. The nonthermal effect negatively effects the metabolism without raising the body temperature;

-- the threshold of the nonthermal effect has not been clearly defined and and various countries have therefore accepted different values of safety margins.

We must deal with only nonthermal effects in residential areas primarily situated some distance from sources of radiation. The nonthermal effect is characterized by the fact that it induces metabolistic disturbances, especially in the nervous and circulatory system and the production of blood cells and hormones. These disturbances can manifest themselves with symptoms such as a general feeling of weakness, excessive fatigue, sleepinessduring the day, poor sleep at night, memory lapses, difficulty in concentrating, headaches and heart problems.

Radiation levels responsible for thermal effects can only be found in the closest proximity to field sources and wherever the radiation sources are operated.

Current Legal Regulations

As we have already mentioned, specific government settlements on non-ionizing electromagnetic radiation were established by the Council of Ministers' 5 November 1980 decree. This decree covers only non-ionizing radiation in the form of 50 Hz electromagnetic fields of frequencies of from 0.1 to 300,000 MHz. As we previously stated, particular danger to the environment and human health is posed by the following:

-- 50 Hz electromagnetic fields found in the near proximity of electrical power plants and power lines of highest voltages (above 220 kV);

-- electromagnetic fields of 0.1-300,000 MHz found near the antenna of radio broadcasting stations, television and radio stations as well as near radar and radionavigational stations and especially the fields found in close proximity

to high frequency industrial, medical and scientific devices.

The decree defined two zones of protection near the above sources:

-- The first-degree zone which prohibits the presence of any population with the exception of persons employed for service of this equipment. This zone includes the area within which radiation levels exceed our nation's currently accepted safety standards, based on Polish and international research.

These radiation levels are, in order of frequency: 50 Hz -- 10 kV/m; from 0.1 to 10 MHz -- 20 V/m; from 10 to 300 MHz -- 7 V/m and from 30 to 300,000 MHz -- 0.1 W/m^2.

-- The second-degree safety zone allowing the temporary presence of people for economic, touristic and recreational purposes. This zone does, however, prohibit the location within it of housing and buildings requiring some form of protection against electromagnetic fields, especially hospitals, boarding schools, nurseries, preschools, etc. The limits for radiation levels in this zone are several times lower and are, in order of frequency: 50 Hz -- 1 kV/m; from 0.1 to 10 MHz -- 5 V/m; from 10 to 300 MHz -- 2 V/m and from 300 to 300,000 MHz -- 0.023 W/m_2.

The second-degree zone of safety is supposed to ensure that allowable radiation levels in housing be several times below those recognized as safe for the human organism. The introduction of this additional margin of safety was dictated by the possibility that the local radiation levels in housing near the source may increase in relation to the natural radiation found in the area before the housing was constructed. These increases in radiation may occur in the direct proximity to power plants, telephone installations and metal objects that accumulate electromagnetic energy and themselves become field sources.

According to the decree, specific decisions on the placement of protection zones are to be released by provincial organs of state administration. These decisions will be based on measurements and the opinions of regulatory agencies such as:

-- for sources of 50 Hz frequencies, the Energopomiar Power Industry Measurement and Research Works in Gliwice;

-- for 0.1-300 MHz frequency sources, the State Radio Inspectorate in Warsaw;

-- for sources of frequencies between 300 and 300,000 MHz, the Industrial Institute of Telecommunications in Warsaw.

Characteristics of Protective Zones Close to Field Sources

Particular sources of radiation have their own properties that determine the how the electromagnetic radiation is propagate and the shape of the protective zones closest to the sources of radiation. In order to clarify the subject, a brief description is given below of the characteristics of protective zones in proximity to particular groups of radiation sources. The characteristics are

based on known results of practical and theoretical studies. However, it must be pointed out that individual assessment of the measurements taken at specific sources of radiation is always necessary.

Power plants and lines of 50 Hz. The breadth of a protective zone is determined according to the voltage level of the given power plant and its power lines. For standard 400 kV power lines, the protective zones will extend 20 or more meters along either side.

Long- and medium-wave transmitters. These installations work within a frequency range of 0.15-1.6 MHz and are used to transmit radio programs. Electromagnetic energy radiated from free-standing tower antennas spreads out concentrically over the surface of the Earth.

The protective zones may extend as far as several hundred meters at average station power levels of 20 or more kW or several kilometers at the highest output levels of a few megawatts.

Short-wave transmitters. Short-wave transmitters operate at frequency ranges between a few and 20 or more MHz and are used for radio broadcasting as well as radiotelegraphy and radio telephone communications. The antennas of such stations usually radiate energy in one direction at a certain angle to the Earth's surface. Therefore, most of the energy closest to the antenna is released at an altitude of 20 meters or more. The extent of the protective zones around such transmitters is therefore determined by the height of transmission and direction. This usually means that the protective zone will be anywhere from 20 meters or more for areas with low buildings to a few kilometers for high buildings within range of the radioactive field.

Microwave radio stations and television stations. Installations such as these operate on frequencies of from a few score to several hundred meters wavelength. The antennas radiate energy outward but thanks to the fact that they are suspended at high altitudes (as high as several hundred meters), most of the radiation is propagated far above the ground and surrounding buildings. With buildings of normal height, protective zones are unnecessary.

Radar stations. Radar stations work at frequencies of several thousand MHz. The energy is directed in the form of very narrow beam and is often propagated outwards in straight lines. Due to the fact that the antenna are suspended at high altitudes (a few score meters), there are usually no protective zones in areas in which there may be people. It must be pointed out that the ranges of these beams are among the greatest and can, in the case of the most powerful radar stations, reach as far as several hundred kilometers.

Closing Remarks

Poland is one of the first countries to adapt measures of protection against non-ionizing electromagnetic radiation. It has made this problem a matter of great priority with Sejm legislation. This has done much to make it possible to properly protect the health and needs of society while encouraging the nation's economic development. The starting conditions have been favorable for

a program such as this because, in most cases, there has been no conflict between legal regulations and the operating conditions of facilities that produce such radiation. The primary factor here has been the policy of the communications and power industries. They have duly evaluated the problem, have been issued their legal ascertainments and have tried to introduce proper designs of radiation sources and to select parameters that would produce negligible pollution from electromagnetic energy.

We cannot, however, overlook the fact that the development of technology tends to produce an ever increasing number of transmitters to communicate more and more information. Furthermore, in order to attain qualitatively better reception of this information, transmitters will require even more power and this means that they will emit more energy into the environment. New technology is being introduced, such as satellite television providing residential areas with direct reception of satellite signals.

This will require special care and consideration in the laying out of protective zones, the design and operation of radiation sources and the design and location of residential areas. It will be necessary for us to have a good knowledge about this form of radiation. There must be cooperation between the designers of radiation sources, architects and representatives of state administration and regulatory services responsible for decisions and advice on the management of the environment around radiation sources and the location of those sources as well.

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*The length of an electromagnetic wave, λ, is the distance covered by propagated electromagnetic disturbances during one full period of change in the distribution of charges of a field source. If the energy is propagated in a vacuum (air), then $\lambda = c \times T$, where c is the speed of light and T is the period of oscillation of the source charges. The frequency of an electromagnetic field (radiation) is determined as the number of source charge oscillations per second. This is the inverse of the period, T, and is expressed in Herz (Hz). In the case of radiation propagated in a vacuum (in air), the frequency is connected to the wavelength by the equation λ (m) = 300 (f/MHz).

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SERIOUS ECOLOGICAL DANGER DESCRIBED

Warsaw TYGODNIK KULTURALNY in Polish No 39, 23 Sep 84 p 7

[Article by Stanislaw Harasimiuk: "Horror"]

[Text] Scientists from the Lublin Institute of Rural Labor Medicine and Hygiene have tried to get used to the fact that since the institute came into being they have helplessly observed the progressive devastation of the natural environment which is, in many regions, becoming a decreasingly less natural environment. The atmosphere, surface and ground water, fields, meadows and forests are all becoming strongly polluted by industrial wastes, heavy metal elements, oxides, dust, fecal matter and communal wastes. Chemical fertilizers, pesticides, herbicides and waste from large farms are improperly handled.

Like many other "forbidden" subjects, ecological danger suddenly ceased to be a taboo word in 1980-1981. Therefore, under public pressure the Ministry of Health ordered special agencies to earnestly and carefully study and document environmental dangers to human health and existence. The Lublin Institute of Rural Labor Medicine and Hygiene was assigned the task of coordinating one of the ministry's programs.

Let us cooly and scientifically accept the fact that the ecological conditions of some of the industrial regions in our country which the fishermen and hunters of Western Europe once dreamed of as a paradise of clean water, game lands and fields of grain have been so heavily damaged that where the fisherman can now catch salmon from the Thames near London, we can fish from the Vistula at best some old shoe covered with a layer of junk in which a chemist could with no trouble find elements from the entire periodic table. Let us now turn to the scientists and their unforgettable reports.

Miasteczko Slaskie Iron and Steel Works

This fine plant has been emitting (what an elegant scientific term!) alkaline dusts, sulfur oxide and sulfur dioxide into the atmosphere since 1966. In the wastes from this iron and steel works, the colossus is defined as a large content of zinc, lead, cadmium and magnesium, not to mention sulfur and carbon monoxide compounds. Zinc, lead and cadmium are of course the most dangerous elements for human health. Thus, at first there were only 15 milligrams of

zinc per kilogram of earth in the area of the iron and steel works in 1966 but by 1981, the zinc per kilogram of soil had risen to 1650 milligrams, a hundred-fold increase. It was the same case with lead content but somewhat better with cadmium (in 1966, there was 0.1 mg per kilogram of the soil dust layer whereas today we find 11 mg and cadmium is the most dangerous element in terms of its biological impact).

It is therefore not surprising that the vegetation in the immediate area of the iron and steel works is in a degraded state. What does this mean in concrete terms? Nothing in particular except that potato crops produce only half of the yield they did before the works were built (which may be all the better since the potatoes contain lead, zinc and cadmium). Plants, especially ground plants, vegetables and root crops, particularly carrots, are a real storehouse of cadmium whose concentrations exceed all allowable limits.

What other real meanings does "degraded vegetation" still have? Does it mean that 17,000 hectares of forest in Swierklaniec Forest District "is damaged"? Within this damaged area, 2245 hectares are heavily damaged and 145 hectares are totally damaged by now (which means they have been destroyed and are useless).

Of course, not only have the soil, air and plants been damaged but the water has also become very polluted. For example, "above normal" concentrations of Zn, Pb, NH_4, SO_4, etc., have been found in the Graniczna Woda stream and the the Sole River.

Aside from zinc and its so-called final products, the works also turn out an enormous amount of wastes in the form of slag and dusts. Due to their lime content, some of these wastes have been qualified for use in liming fields. Unfortunately, closer analysis has shown that entire lots of these "fertilizers" contain unacceptable concentrations of lead and zinc.

In connection with this, we can in no way say that the works are polluting the environment under no control or supervision. Just the opposite is true. Since 1966, the works' very environment and ecological dangers have been scrupulously studied by the Silesian Polytechnical Institute, Silesian Medical Academy and the Institute of Environmental Engineering. In 1970-1973, the Silesian environmental specialists were joined by their colleagues from the Institute of Cultivation, Fertilization and Soil Science in Pulawy, the Institute of Soil Science and Agricultural Chemistry in Lublin as well as the Lublin Institute of Rural Labor Medicine and Hygiene. Finally in 1981, the study and protection of the environment around the zinc works at Miasteczko Slaskie was included by the Ministry of Health in a special program that even received a level I priority. Scientists have investigated the actual state of affairs, formulated conclusions and recommended further study. Whatever there is to be done now is not in their domain and they have said what needs to be said.

Pillar of Poisons

The Patnow and Konin electrical power plants alone release more than 70,000 tons of SO_2 (sulfur dioxide) every year along with the same amount of various

types of dust.

But that is still nothing. The Konin Aluminum Works beats all electrical power plants together: according to careful scientific calculations, the Konin works systematically releases fluorine that spreads over a distance of 30 kilometers out. This means that a great circle of 60 kilometers in diameter is directly exposed to fluorine and an area of 32 kilometers in diameter is very strongly exposed since fluorine concentrations there twice exceed allowable norms. Of course, this is nothing in comparison to the concentrations found within 4-5 kilometers of the plant where they 10 times exceed all allowable norms. This tenfold high fluorine concentration does not endanger the city of Konin itself but there are villages, fields, orchards and gardens within this zone. Unfortunately, fluorine is not quickly neutralized. Its neutralization is greatly hindered by the fact that the soil around Konin has much sulfur dioxide which sharply reduces the rate at which fluorine compounds can be neutralized.

Sulfur and fluorine destroy biological life, vegetation, crops and forests. 1675 hectares of forests are exposed to the effects of these elements. The rate of damage is quite high and 673 hectares have been affected over the past 8 years.

Trees are dying. People are living. They are working hard in a dynamically growing district and city. They are surpassing production quotas, smelting aluminum, generating megawatts of electrical power and producing wastes, slag, sulfur compounds and fluorine. Managers drive themselves to meet deadlines. Their ambitions are great.

Gigantic areas for the open-pit mining of brown coal have caused irreversible changes in the water table over a large area. In some places, the water table has dropped sharply while in other areas, fields and meadows are turning into swamps. To add to all of this ash and slag, enormous amounts of furnace waste containing large amounts of dangerous elements are increasing yearly. In the exploited area, pollutants are added to million and hectroliters of industrial effluent. We do not know where and when they will affect man but we do know they will. Meanwhile, chemical processes continue uninterrupted in waste piles and exploited areas and in the soil water. The amount of sulfur and fluorine in soils has gone up and ammonia, nitrogen, iron and magnesium ions are increasing in the water.

Effluvia From the Combine

Chemicals have always been a threat to the biological environment everywhere. The West had a problem with chemical pollution until the 1960's and the problem is now with us. We simply cannot afford the costly, dollar-expensive filters and purification equipment. For this reason, the Police Combine is releasing pollutants at a rate three and a half times above established norms. For example, it was planned for the combine to release only 2469 kg of sulfur dioxide but by 1975 19,284 kg was already being emitted. In the first few years of the 1980's, that figure was reduced to 12,682 kg.

What pollutants are being released by the Police Combine? Chemists have found the most burdensome compounds such as SO_2, SO_4, H_2SO_4, NH_4 and fluorine, thus fluorine and sulfur and again emitted over a large area. The acceptable concentration norms are being exceeded over an area of 140 square kilometers.

Neighboring the Police combine is a gigantic dump for phosphorus gypsum and strongly acidified production wastes. Every year, two million tons is added to this dump. At the present time, this dump covers 85 hectares but in 7 years, by 1990, it will cover 150 hectares at an average depth of 35 meters.

Therefore, we should not be surprised that the phosphorus concentration in the Bay of Szczecin has been increasing for years. It will continue to increase, too. It is not far from the monstrous dumps to the waters of the bay.

As if this were not enough, communal waste is seeping into the gravel quarry in Trzebiez which is also close to the Bay of Szczecin. Poison is poison.

There Was a Forest...

The Pulawy Nitrogen Works have already been described numerous times as a cause of ecological catastrophe to forests. It is true that over 300 hectares of vegetation has disappeared. Together with its investments, the Pulawy works have "taken care of" about 1000 hectares of forest. Lesser but still grievous damages have been inflicted on 5400 hectares of woodlands. In 1981, research teams determined that altogether about 8000 hectares of forest have suffered industrial damages.

This is not surprising since, as early as 1969, the Pulawy works was releasing as much as 22,000 tons per year of NH_4 alone. People are now moderately optimistic since the Pulawy Nitrogen Works now release "only" 10,000-12,000 tons. Unfortunately, along with the effluvia from electric-thermal power stations, that is enough to pollute the soil to a degree that any edible plants grown in it will often contain above-normal concentrations of harmful substances. In principle, it should be forbidden to grow carrots,vegetables and root crops in areas under direct exposure to nitrogen compounds.

The moderate optimism on the Pulawy works is based on the claim that the moonscape around the plant will change with time. On an experimental level at least, there has already been some change. There is even some talk about returning some of the land to agricultural use. This is, however, a big exaggeration. It is 100-percent certain that, under the present conditions (and they do not look as if they will ever change), no forest will grow near the Pulawy works and no grain grown there will be fit for bread or livestock fodder. At most, only so-called low crops can be grown to prevent complete dessication and wind erosion of the land. But these low plants must be utilized even though they cannot be used for fodder for fear of poisoning animals.

Of course, it is better to have "low green plants" than a complete desert.

The Danger to Krakow

There does not seem to be any other Polish city that has felt the effects of bad development as much as Krakow. The Nowa Huta combine was built on thousands of hectares of good agricultural fields, has destroyed the environment and has in 25 years damaged old buildings and monuments that have survived centuries. Professor Aleksandrowicz can be asked to what degree the Lenin Steel Works has affected the lives and health of the people of Krakow. He can only estimate because no one has of yet made an exact study of the health effects that industry in Krakow has had upon its inhabitants. Such studies are still only in the planning stages.

On the other hand, we know the ecological conditions there well enough. In 1981-1983, they were closely studied and the "Preliminary report on the state of the environment in Krakow" was published.

This report clearly indicates that the greatest "poisoner" is of course the Lenin Steel Works which employs over 10 percent of the entire work force in the province. The Lenin works alone harm the ecology more than all of the other 174 factories in Krakow together with the exception of the already well-known Skawin Aluminum Works. Much pollution is also created by the Skawin electrical power plant, the Leg electric-thermal power plant, the Solvay KZS [expansion unknown] and the Bonarka KZPN [expansion unknown]. It is perhaps worth mentioning that just the plants mentioned by name accumulated 40 million tons of waste on 400 hectares by 1980. These dumps contained the most varied harmful compounds and elements. The city itself adds more than a million cubic meters of communal waste to this great "ecological time bomb."

Large-scale emissions into the atmosphere of dust and smoke containing enormous amounts of harmful oxides are immeasurably dangerous. As if Krakow does not have enough of its own smog, clouds of smoke blown westwards from Polaniec and Tarnow hang over Wawel Castle and more smog is blown east from Silesia (westerly or easterly winds blow over Krakow 70 percent of the days of the year). It is therefore not too surprising that the concentration of dust and oxides, especially sulfur dioxides, over Krakow is several times higher than the allowed standards for Poland.

As we remember, part of the general national quarrel in Poland in 1981 concerned the murderous environmental and health effects of the electrolysis division of the Skawin Aluminum Works. This plant still releases unacceptable concentrations of fluorine, especially in summer.

The situation with water, including drinking water, in Krakow is also bad. At the Bielany Water Treatment Plant, water often fails to meet Polish standards for drinking water even though they have been many times "liberalized" and loosened and are the most "tolerant" standards in Europe. The water situation is somewhat better in Rudawa and Dobczyce. Good water is only available in Dlubnia.

It is shocking enough to repeat the results of laboratory studies that have determined that water taken from spigots in the central district of Krakow

contains coliform bacteria (of fecal origin...).

A four-year study conducted in Krakow has shown increasing ecological danger and a constant deterioration of the atmospheric environment in spite of countermeasures that have been taken. Some sort of countermeasures may have been taken but they certainly have not had any effect.

The Conclusions of Scientists

In 1982, as a result of the pressures exerted the previous year, the lead, cadmium, nitrogen and fluorine content was studied in plant products taken from industrial lands and heavily-travelled roads and published in a report. We read: "It has been determined that many of the samples studied contain amounts of the above elements that considerably exceed their highest permissible concentrations for food products. A two- to tenfold overconcentration...of these elements was found in plants taken from fields cultivated in the iron and steel regions of Silesia.

"The degradation of the natural environment has continued for many years and has damaged the landscape, worsened sanitary conditions, cut down on the amount of land available for agriculture...and has led to an increase of pathological changes in the organisms of both man and animal.

"Over the past 35 years," the report continues, "we have lost about 1.4 million hectares of arable soil, meadows and orchards. At the end of the war, Poland had about 0.86 hectares of agricultural land per person and in 1975 there was only 0.5 hectares per capita (and now the figure is 0.44 hectares). It is estimated that 80 hectares of agricultural surface (not counting unusable land) is lost each day."

The environment now is being polluted not only by industry but by agriculture as well. Great devastation is being caused by farms that poorly manage dung heaps. Much damage is also being caused by improper use of chemical fertilizers and herbicides or pesticides. The littering of woods and fields with waste products and discarded packaging is becoming a problem. Rivers are often poisoned not only by the food and chemical industries but also by the farmers themselves or tractor operators from SKR [expansion unknown] who dump garbage into the water or wash out poison, pesticide or herbicide containers in creeks.

And what of it? Nothing. Life goes on.

"Widespread and lasting chemical pollution," states the scientists' report, "is reaching the threshold of safety and has already crossed it in some regions..."

Someone said that the facts and report above reeks of catastrophe. Perhaps this is so but one cannot be angry with facts. This has never helped anything and I can assure you that I am not trying to scare my readers. But as the author of this article I cannot remain silent when I have spent 12 years describing with the regularity of a Swiss watch the various regions of our

country with increasing anxiety. I have seen ever greater violation of the lowest environmental standards. I would simply be dishonest if I were to close my eyes to the real conditions in which not only I but all of us live.

Of course, everyone knows that we are having a crisis, are under severe restraints and have more needs than we can satisfy. This is true enough but is there anything more valuable than human health and life?

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PROGRAM FOR DEVELOPMENT OF SCIENCE, TECHNOLOGY DISCUSSED

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/Article by Mihail Florescu: "The Promotion of the Newest Gains of Science and Technology, an Essential Factor in the Strategy for Romania's Progress"/

/Excerpts/ A far-reaching phenomenon in mankind's many fields of activity, the development of science and technology has a decisive role in the rapid transformations of the production forces, imparting spectacular vitality to all economic and social life. In this period, all mankind is a participant in a great revolution in science, engineering and technology, with the development of any sector of social life being inconceivable without the new gains of human creativity. As world experience shows, the contemporary scientific and technical revolution offers the possibility of cutting the time required for reducing the economic gaps, necessitating at the same time the expansion of the efforts to apply its gains to production.

Romania's economic and social development in this period, in which the transition to a new stage of the scientific and technical revolution is occurring throughout the world, requires the growth of the contribution of its own scientific and technical research to this process, which will permit the obtaining of a high standard of living for the population, the growth of national income, and Romania's affirmation within the international community. Over the four decades of socialist construction, the expansion of the economic and social effects of national scientific research and the growth of the efficiency of the solutions proposed and of the promptness with which they are assimilated into production have represented constant concerns of the policy promoted by our party and state. These orientations of a true historical opening were enhanced from a theoretical and practical viewpoint starting with the ninth party congress, when the foundations were laid for a scientific strategy with regard to increasing the national potential for research and more deeply involving the staffs of researchers in solving the complex problems of economic and social development.

The Continually Growing Material and Human Potential for Research

Since the ninth party congress, in the context of these revolutionary changes, the flourishing of science and technology and the affirmation of national technical creativity have constituted a major component of the new course imparted

by Comrade Nicolae Ceausescu to the political thought and practice of the party and state. Combating some preconceptions due to which our own activity of scientific research was not judged at its correct value, the political orientation initiated by the party's secretary general at the ninth congress, of connecting science with production and the life of society, of directly integrating our own research into the whole populace's effort to attain the objectives of economic and social development, marked a profound revolutionary reevaluation of the role of national science and technology within economic and social activity. Under the prompting and direct guidance of Comrade Nicolae Ceausescu, Romania acquired for the first time a programmatic state policy in the field of scientific and technological research.

Referring in many speeches, on various occasions, to the role of science, Comrade Nicolae Ceausescu has mapped out a series of guidelines which substantiate the development of science and technology in our country and which, in essence, refer to: the defining of science as a strong material production force; the continual expansion of the material and human base of research and development; the connecting of research with production and education, with all the positive implications that result from this for science and culture, for production and for the training of personnel for the future; the defining of the relationship between applicative research and basic research; the immediate application of the results of research to production and social life and the orienting of research to move a step ahead of practice; and the frequent exchange of opinions and scientific values on an international level.

Being of great importance for material production and for the economic management of society, science and technology, in their relationship to the system of national wealth, receive information and human and material resources whose value has risen year by year, especially in the period after the ninth congress. In Romania, the work force engaged in scientific and technological activity in 1984 is about 235,000 persons, of which 47 percent work in research and development institutes and education, 23 percent in design and 30 percent in plants. The personnel will be 9 times greater in 1985 than in 1965. In recent years, the annual rate of growth of the work force in research has been 4.7 percent--higher than the rate of growth in industry. In 1983, the percentage of personnel with higher education represented 40 percent of the total work force in research and technical progress--a rise of 32 percent since 1975.

The total volume of the current expenditures for the activity of research, development and technical progress represents about 2 percent of national income, it being at the average of the expenditures now made in the industrially developed countries. In the past decade, the annual rate of growth of the total current expenditures was 13.8 percent, a rate higher than the growth in national product and national income. In view of the concern for securing the development of science and technology in the future, about 14 percent of the funds allocated are spent on research with a basic character.

The volume of research activity, expressed in material expenditures, will be over 14 times higher in 1985 than in 1965 and the technical-material base of technological research and engineering will be over 17 times bigger.

The results obtained by Romanian research in the last two decades have led to the putting into manufacture of tens of thousands of machines, pieces of equipment and apparatus, installations, materials and consumer goods, and as a result, at the end of each 5-year period, the value of the new and redesigned products put into production has represented nearly half of the total value of the commodity output. In addition, a large number of new and modernized technologies have been put into production--ones through which a continual reduction of the consumption of raw materials, supplies, fuel and energy, an improvement in the quality and a rise in the technical level of products have been achieved.

Having as a basis the provisions of the Directive Program for Scientific Research, Technological Development, and Introduction of Technical Progress in the 1981-1990 Period and the Main Directions up to the Year 2000, adopted by the 12th party congress, the tasks contained in the 1981, 1982 and 1983 plans for research, development and technical progress, fulfilled completely and applied to production and social life, have led to the putting into manufacture of over 10,000 machines, pieces of equipment and apparatus, and installations, nearly 2,000 materials and over 1,000 consumer goods. In the first 3 years of the current 5-year period, 3,300 more products were put into manufacture than in the corresponding part of the 1976-1980 5-year period. The value of the new and modernized products obtained in these 3 years of the current 5-year period was 118 billion lei in 1981, 191 billion lei in 1982 and 270 billion lei in 1983. In addition, in the first 3 years of the current 5-year period, nearly 4,300 new and modernized technologies were put into production and expanded in production, especially in the chemical, metallurgical, light, machine-building, electrical-engineering and electronics industries. Some 130 objectives in automation and mechanization of the production processes in industry were applied to production.

As an effect of utilizing in production the results of research, a number of economic and financial results were obtained, representing in the 3 years the following values: over 20 billion lei in extra profits; 35 billion lei in the reduction and replacement of importation; and over 16 billion lei in the growth of exportation. In addition, for the final years of the current 5-year period--1984 and 1985--important objectives in research, development and technical progress are provided, of which over 3,500 will be applied to production. For the most part, these objectives come from the directive program and from the special programs that pursue the growth of labor productivity, the raising of the quality and technical level of products, the assimilation of materials and equipment for the peak branches of industry, the expansion of the utilization of new and reusable energy sources, the further reduction of imports and the growth of exports, the economization of material resources, especially fuel, electric and thermal power, metal and other scarce raw materials, the better utilization of the work force, the raising of labor productivity, and the growth of profitability and economic efficiency.

As a result of putting into production the new products provided in the plan and raising the production levels for the products assimilated in 1981, 1982 and 1983, it is expected that the percentage of new and modernized products in the total commodity output planned in the processing branches of industry will reach 40 percent at the end of 1985.

A Far-Reaching Strategy Harmoniously Integrated into the Process of Development

A decisive stage in carrying out the party's Program for Forging the Multilaterally Developed Socialist Society and Advancing Romania Toward Communism, the 1986-1990 5-year period will provide for our homeland's entry into a new, higher phase of its economic and social progress, strongly marked by the growth of the role of science and technology in all fields of activity. In accordance with these imperatives, under the direct guidance of Comrade Acad Dr Eng Elena Ceausescu, member of the Political Executive Committee of the RCP Central Committee, first vice prime minister of the government, and chairman of the National Council for Science and Technology, with the direct participation of the central institutes, the academies of sciences, the scientific research and technological engineering units, the ministries and the industrial centrals, the Program for Scientific Research, Technological Development, and Introduction of Technical Progress for the 1986-1990 Period was drawn up. The program has in view the fulfillment of the tasks that result for the activity of scientific research and technological development from the instructions of the party and state leadership, from the Directive Program in the Field of Scientific Research, Technological Development, and Introduction of Technical Progress in the 1981-1990 Period and the Main Directions up to the Year 2000, from the decisions of the National Conference of the Romanian Communist Party, from the special programs drawn up by the National Council for Science and Technology together with the economic ministries and from the programs of the ministries for products and groups of products.

It can be said that there is practically no field or objective for which in the program there is not provided the attainment of new solutions--technologies and products--which research must achieve in a short time, with minimum material expenditures, but through an effort of conception and a mobilization without precedent. Starting from this, the wide participation of the researchers, designers, engineers, teaching personnel in higher education and other specialists has been secured in all stages of working out the objectives in research, development and technical progress.

The work of research, development and technical progress in the period of the near future up to the end of this decade and in the final part of the millennium will pursue mainly: the development of the energy base through the efficient utilization of national energy resources and new sources of electric and thermal power and motor and other fuels; the development of the base of raw materials through the introduction of new deposits into the economic circuit, the extraction, enrichment and economic utilization of ore with a low amount of useful substances, the complex utilization of raw materials and supplies, the higher processing and the utilization of technological byproducts, and the growth of the degree of recovery of mineral reserves; the introduction of scientific and technical research into agricultural and zootechnical practice in the context of carrying out the new agrarian revolution, the expansion of the work of genetic engineering for achieving high-yield varieties and hybrids, the utilization of biomass through biotechnologies for obtaining petrochemical products and motor fuel, and the expansion of bioenergetic crops; the improvement and modernization of the technologies in the food industry and the supplying of modern equipment and installations for the purpose of achieving big,

high-quality outputs, using the vegetable and animal resources as efficiently as possible, for providing diversified, nourishing food that helps to improve the state of health of the population; the application of biotechnology and bioengineering for industry and of genetic engineering for obtaining proteins and amino acids, and the utilization of biomass and bioenergetic crops; the development of the production of microprocessors, minicomputers and industrial robots, the intensification of the microelectronic revolution and the telematic revolution, and the introduction of laser techniques, vacuum technology, cryogenics and applications of microwaves and ultrasonics into current practice; and the raising of the qualitative and competitive level of all products and services by achieving and putting into production efficient manufacturing technologies and processes.

In addition, the following are being pursued: the growth of labor productivity through the expansion of mechanization in various fields of activity (the extractive, metallurgical, construction-materials and light industries, transportation, construction and so on), through automatic management of the production processes and through the introduction of automatic data processing into the management, planning and supervision of the activity in various fields of the national economy; the achievement and diversification of production with a view to the further reduction of imports and the growth of the competitiveness of the products for exportation; the improvement of the production processes in order to obtain a greater savings of materials and reduce the specific consumption of raw materials, fuel and energy; the implementation of the construction program by devising and improving the technological and construction solutions for the construction of housing and facilities of economic and social interest; the development of the standardization of constructions and technologies with a view to reducing the assortment and prototype dimensions, reducing consumption and improving the constructions; and the introduction and generalization of the action of standardization of technological lines and installations, of products and of materials, with a view to the continual reduction of the consumption of raw materials, supplies and energy, meant to contribute to the growth of labor productivity in all social production.

An important role goes to the research in the medical and health-care field, especially: the improvement of the state of health of the population, the prevention of illness, the preservation of the ability to work, and the extension of the period of active life; new means and methods of combating chronic illnesses, neuropsychic, digestive, cardiovascular and other ailments, and communicable diseases; the ensuring of the normal development of children and young people; and the development of the research for the better utilization and the protection of water, air and soil resources. The research in the field of the social sciences will have in view the improvement of social relations, the formation and development of the social consciousness of the working people, the synthesization and theoretical generalization of our country's experience in the construction of socialism, and the utilization of cultural heritage; the development of basic theoretical research in mathematics, physics, chemistry, biology, medicine, agriculture, construction and other fields, for the purpose of providing a reserves of scientific solutions of our own, needed for solving future technical and economic problems; and contributions to knowledge of the mechanism of life, research for knowing and discovering the laws of nature, space research, and knowledge of the planetary system and the universe.

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